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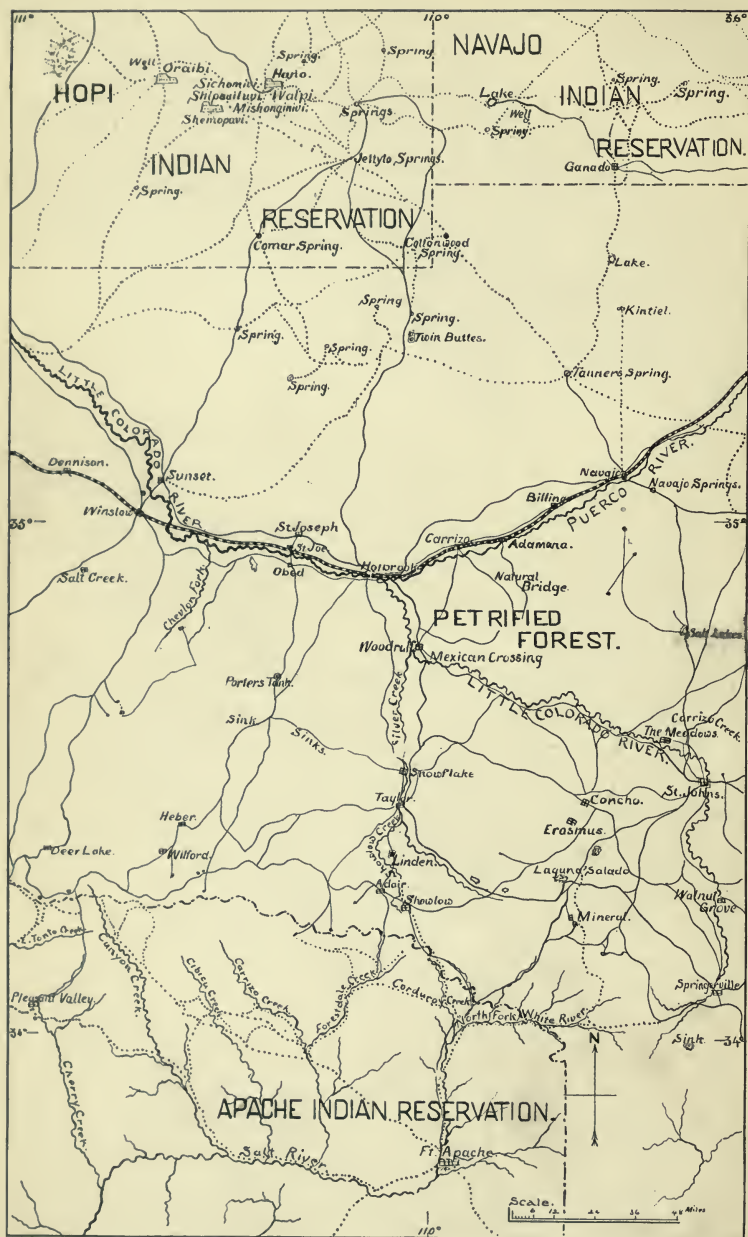
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GENERAL MAP OF THE REGION.

ARCHEOLOGICAL FIELD WORK IN NORTHEASTERN ARIZONA.
THE MUSEUM-GATES EXPEDITION OF 1901.

BY

WALTER HOUGH,

Assistant Curator, Department of Anthropology.

1903

TABLE OF CONTENTS.

| | Page. |
|---------------------------------------|-------|
| Introduction | 287 |
| White Mountain Region | 289 |
| Forestdale | 289 |
| Interior Sawmill | 297 |
| Linden | 297 |
| Showlow | 301 |
| Shumway | 302 |
| Little Colorado Valley | 302 |
| McDonalds Canyon | 302 |
| Scorse Ranch | 306 |
| Canyon Butte | 309 |
| Adamana | 317 |
| Metate | 318 |
| Woodruff | 318 |
| Milky Hollow | 319 |
| Stone Axe | 320 |
| Small Sites near Stone Axe | 325 |
| Hopi Buttes and Mesas | 326 |
| Biddahoochee | 326 |
| Chakpahu | 336 |
| Kokopnyama | 337 |
| Kawaiokuh | 339 |
| Periods of Tusayan ware | 346 |
| Age of Jettyto Valley ruins | 349 |
| Remarks | 352 |
| Types of Buildings | 352 |
| Distribution of Pueblo Culture | 352 |
| Range of Dual Design on Pottery | 354 |
| Symbolism | 355 |
| Domestic and Food Animals | 356 |
| Preservation of Ancient Ruins | 357 |
| Summary of Work | 358 |

LIST OF ILLUSTRATIONS.

PLATE 1. General map of the region.

FORESTDALE.

2. Sketch map of Forestdale ruins.
3. Plan of Tundastusa ruin.
4. General view of Tundastusa ruin.
5. View of Kiva.
6. View on Acropolis.
7. View of wall of Acropolis.
8. Bird-form mortuary vase and bowl.
9. Paint cup and double bowl.
10. Bowl of Gila type and handled vase.
11. Mortuary vases of gray ware.
12. Fetiches of pottery and stone, and scrapers.
13. Bone implements.

INTERIOR SAWMILL.

14. Stone and bone implements.

LINDEN.

15. Plan of Pottery Hill ruin.
16. Plan of smaller ruin near Linden.
17. Circular portion of small ruin near Linden, Ariz.
18. Gray ware.
19. Bowls of gray ware.
20. Bowls of red ware with exterior decoration.

SHOWLOW.

21. Plan of Huning ruin.

SHUMWAY.

22. Plan of ruin.

MCDONALDS CANYON.

23. Plan of ruin.
24. Bowls of gray ware.
25. Bowls of gray ware.
26. Vases of gray ware.
27. Rugose bowl, red ware, side and back.
28. Rugose bowl, side and back.
29. Canteen and handled vase.

SCORSE RANCH, LE ROUX, WASH.

PLATE 30. Sketch map of ruins.

31. Handled vases, gray ware.
32. Bird and other forms, gray ware.
33. Bowls of gray ware.
34. Bowls of gray ware.
35. Bowls of red ware.
36. Vases, coiled and red ware.
37. Stone axes, mortar and pestle.

CANYON BUTTE WASH, PETRIFIED FOREST.

38. Sketch map of region.
39. Plan of ruin 1.
40. Plan of ruin 2.
41. Plan of ruin 3.
42. Polychrome bowl and painted stone tablet.
43. Outfit of medicine man.
44. Plan of ruin 4.
45. Coiled ware.
46. Bowls of rugose and red ware, white exterior decoration.
47. Red bowls with white exterior decoration.
48. Red and brown bowl, exterior and interior decoration.
49. Red and brown bowl, exterior decoration.
50. Bowls of gray ware.
51. Vases of gray ware.
52. Pipes from ancient pueblos.
53. Plan of Milky Hollow ruin.

STONE AXE RUIN, PETRIFIED FOREST RESERVE.

54. Plan of ruin.
55. Stone implements.
56. Bone, pottery, shell, and stone objects.
57. Large vase, polychrome ware.
58. Bowl and vase, yellow ware.
59. Bowls, yellow ware.
60. Bowls showing symbolism.
61. Bowls, white and Gila ware.
62. Bowls, yellow-brown and red, with white line.
63. Bowls, red ware.
64. Vases with animal handles.

BIDDAHOCHEE, COTTONWOOD WASH.

65. Sketch map of group of ruins.
66. Plan of ruin on bluff.
67. 1. Black Butte; 2. Ruin in front of Butte.
68. Bowls, yellow ware.
69. Bowls, yellow ware.
70. Dipper, cup, and handled bowl.
71. Vases with bird decoration.
72. Vases of yellow-brown, and lemon yellow.
73. Vase of orange color.
74. Bowl, red ware, green decoration.

- PLATE 75. Bowls of polychrome ware.
76. Bowls of white ware.
77. Vases of white ware.
78. Dipper and vase, gray ware.
79. Small vessels, gray ware.
80. Coiled ware.
81. Stone implements.

JETTYTO VALLEY RUINS.

82. Sketch map of ruins.
83. General view, of Kokopnyama ruin.
84. Cist in rocks, Kokopnyama.
85. Excavating in the talus, Kokopnyama.
86. Hair tied with hair cord, Kokopnyama.
87. Coiled basketry, Kokopnyama.
88. General view from Kawaiokuh.
89. Decorations on wall of room, Kawaiokuh.
90. Potters' kiln, two views, Kawaiokuh.
91. Burials in house cemetery, Kawaiokuh.
92. Jar under floor of room, Kawaiokuh.
93. Small pottery vessels, Kawaiokuh.
94. Vase of parrôt form (Gates collection), Kawaiokuh.
95. Vases of gray ware, Kawaiokuh.
96. Small ornaments and figurines, Kawaiokuh.
97. Basketry and matting, Kawaiokuh.
98. Pottery showing application of color, Kawaiokuh.
99. Bowls showing symbolism and color, Kawaiokuh and Kokopnyama.
100. Pottery showing color and symbolism, Kawaiokuh.
101. Food bowls showing bird symbolism.

ARCHEOLOGICAL FIELD WORK IN NORTHEASTERN ARIZONA. THE MUSEUM-GATES EXPEDITION OF 1901.

By WALTER HOUGH.

Assistant Curator, Department of Anthropology.

INTRODUCTION.

Early in the spring of 1901 the writer was ordered into the field to conduct ethnological and archeological investigations in northeastern Arizona. (See Plate 1.) The plan settled upon embraced two distinct explorations, the first during the month of May, for the United States National Museum alone, and the second from June 1 to August 30, for the Museum in conjunction with Mr. Peter Goddard Gates, of Pasadena, California, whose interest in the exploration of the Southwest has been productive of excellent results for science.

Field work began on May 3, and making Holbrook, Arizona, the base, the McDonalds Canyon ruins to the southeast of that place were visited and explored. The remainder of the month was spent at the Canyon Butte ruins east of Holbrook in a thorough reconnoissance of the Petrified Forest Reserve and a visit to the ruins north of Holbrook. These groups of ruins are new to science, and the results of the explorations are very satisfactory.

On June 1 the Museum-Gates expedition took the field, selecting for exploration a large ruin a few miles east of the Petrified Forest. On the completion of this work the party returned to Holbrook and went south into the White Mountains, reaching, on June 19, the ruin at Linden. On June 26 the party camped on the great Forestdale ruin on the White Mountain Apache Reservation. On July 9 a small ruin at Interior Sawmill was investigated, and after a visit to Fort Apache the expedition returned to Showlow, working for a day or two a large ruin on the ranch of Mr. Henry Huning. Returning north, ruins at Shumway, Snowflake, and Woodruff were examined, Holbrook being reached on July 17.

Here the party renewed its supplies and was joined by Mr. A. C. Vroman, the well-known photographer of Pasadena, who remained taking many views till the close of the season.

July 29 found the party engaged in excavating a large ruin called Kokopnyana, on the Jettyto Wash, 2 miles east of Keams Canyon. On August 11 a ruin near Jettyto Spring called Kawaiokuh was worked for a week, when the party closed excavation and proceeded to the Hopi pueblos for ethnological studies, remaining there till the 28th, when the Museum-Gates expedition disbanded.

The writer returned to Holbrook to complete the packing and shipping of the specimens secured. During September 12-14 the groups of ruins on the Le Roux and Cottonwood washes were carefully platted and plans of the sites made. This closed up the season, and on September 23 the writer returned to Washington.

In addition to the avowed objects of the expedition, collections of plants, fossils, minerals, etc., were made, Mrs. Gates aiding materially in the botanical work. A large series of photographs was made by Messrs. Vroman, Gates, and the writer.

The groups of ruins described in this paper are treated geographically, beginning, for convenience, with the southernmost, at Forestdale. Taking the more important sites in order to the northward, we have Forestdale, Linden, Showlow, Shumway, McDonalds Canyon, Scorse Ranch, Petrified Forest Reserve, Biddahoochee, and Jettyto Valley. This line of archeological reconnaissance shows in an interesting way the prevalence of red and gray pottery south of the Little Colorado and Puerco rivers, with exceptions at Shumway and Stone Axe, gray ware in the Little Colorado Valley, and yellow ware at Biddahoochee and Jettyto Valley. Thus we may divide the field explored into three regions, namely: (1) Region of the White Mountains, red and gray ware; (2) region of the Little Colorado Valley, gray and red ware, and (3) region of the Hopi buttes and mesas, yellow and little red and gray ware. In detail the ruins examined in the region of the White Mountains are Forestdale, Interior Sawmill, Linden, Showlow, Shumway (yellow and red), Snowflake, Woodruff Butte, Canyon Butte, Petrified Forest, Metate ruin, Stone Axe ruin (yellow ware), and Adamana. Those of the Little Colorado Valley are McDonalds Canyon and Scorse Ranch, and those of the Hopi buttes and mesas are Biddahoochee and Jettyto Valley.

The environment of the three regions is semiarid. The White Mountain region, however, from the height and mass of the range, especially the Mount Thomas condensing focus, has greater rainfall than the other regions. For this reason there is here abundant vegetation, and in the radius of this influence and in this respect the environment seems more favorable for human habitation. On the other hand, geological causes have determined the lack of springs on the north side of the range, and dependence must be put on fluvial waters. South of the Mogollon Rim springs are abundant, and here were located important pueblos like those of Forestdale and others in the Apache Reservation.

The conditions in the valley of the Little Colorado are similar in regard to available water supply to that of the White Mountains, but the region is more arid and the vegetation is of desert types, the cottonwood along the stream beds being the only tree.

The region of the Hopi buttes and mesas has an elevation of about 6,500 feet, 1,500 feet above the Little Colorado Valley. Geological causes here also determine the numerous springs in this region, the rainfalls being stored in sandhills or in the heavy strata of porous sand rock underlaid by shales, which brings the water to the surface. This region is practically uninhabitable without corn, which is grown in the beds of the washes and depends on local rains for irrigation. The same remark is true of the second region, while in the White Mountain region hunting tribes could exist.

WHITE MOUNTAIN REGION.

FORESTDALE—INTERIOR SAWMILL—LINDEN—SHOWLOW—SHUMWAY.

FORESTDALE.

On the White Mountain Apache Reserve, southeast of Showlow some 10 miles, and a few miles east of Pinetop, near the headwaters of a creek rising in the Mogollon Mesa, is a remarkable ruined pueblo, which, from its great extent, must have been an important center of population in early days. (Plate 2.) The Apaches call the place "Tun das tusa" (water spread out), from the many springs forming marshy areas. The locality is called Forestdale from the creek of that name. Years ago Mormons made a settlement here, but the Apaches drove them away, burning their buildings except the church, which still remains, surrounded with great pines. The ruin was brought to notice by Bandelier, who hastily examined it in 1883.^a

The country slopes strongly to the south from the Mogollon rim, and the streams drain into the Upper Salt River, which flows approximately 25 miles to the south. This portion of the White Mountain Apache Reservation is rugged, the streams often canyoned and again running through pleasant valleys, with meadows and Indian cornfields. The primitive forest of great pine trees covers the country; grass is abundant, and wild flowers bloom in profusion, giving one an idea of the "Tierra des poblada" as it appeared to Coronado and his followers when they passed through this region in 1540.

The problems of food, water, wood, clay, and stone which were so difficult to most tribes in other portions of the Pueblo region presented no such complexity to the ancients of Forestdale. Most of these good things were near at hand in greater degree than at the

^aFinal Report, etc., 1880 to 1885. Papers of the Archaeological Institute of America, Cambridge, 1892, Pt. 2, p. 400.

neighboring pueblo of Linden; wood was rather a burden, cold, clear water welled beneath their town walls, the rich cornfields required no irrigation, the forest was full of game; manzanita berries and the sweet mescal agave were plentiful. It is not surprising, therefore, that in this favoring environment pueblos of large size were developed; the cause for wonder is that in this region the pueblo dwellers have not persisted to our day.

Tundastusa ruin (Plates 3 and 4) is located on a low elevation between two washes coming into Forestdale Creek from the north, on land claimed by Skidi, a prominent Apache, who has his cornfields near the mouth of the washes where there are springs.

At the highest point is a circular acropolis 160 feet in diameter, giving the area of 1 acre, the walls 2 feet thick and 8 feet 2 inches from the surface to the foundation course, the circle cut up into rooms by narrower walls. At intervals down the slope below the acropolis toward the creek and wash are five or more walls, forming segments of circles concentric with the acropolis circle. Across these segments run radiating lines, showing from a distance as windrows of stone from the fallen buildings. The only plaza in this section of the ruins is a small one on the southeast side. Attached to the acropolis on the west are quadrangular house masses, the general ground plan being irregular or stepped and extending down the slope. Beyond this section of the pueblo to the west is a long L, two rooms deep, containing 104 rooms. On the inner side of the north limit of the L is a parallel row of houses, also two rooms deep. These house rows thus flank two sides of a plaza 1 acre in area, and bounded on the south by a low wall. At the east end of the inner house row a sunken depression 25 feet square probably indicates a kiva, though excavation revealed nothing. (Plate 5.) A curved wing wall closes the opening between the acropolis and the detached quadrangular ruin. This portion of the Forestdale ruin is easily traced. The ruin is estimated to show 300 rooms on the ground floor and perhaps originally contained 1,000 rooms. In area, it covers 7 acres, and its present appearance is that of chaotic heaps of earth and stone, with no walls standing above the surface. (Plate 6.) There are no trees on the ruin. The plan of Forestdale ruin shows three house masses, which strike one immediately as having been constructed at different times. There is no doubt on this point concerning the rectangular ruin some distance to the west; but in order to determine the relation of the house mass attached to the circular ruin the walls at the junction were cleared and it was found that the wall abutting the acropolis rested on 3 feet of rubbish, which had accumulated from the older pueblo. The walls of the middle pueblo are likewise of inferior masonry, not as good as that of the rectangular house mass. It is apparent that the circular ruin is older and formed the nucleus of subsequent accretions. As has been stated,

the artifacts noted in the débris are uniform for the whole site. It must be said, however, that no cemeteries were discovered in connection with either of the rectangular house masses. It seems probable that since all present pueblos are made up of aggregations of clan units, we see in Forestdale an ancient evidence of this fact, which may also explain the occurrence of two modes of burial.

The material used in building is sandstone brought from the ledges cropping out along the little creek close at hand. The blocks of stone are larger and more uniform in dimension than is usual in the pueblos of the Southwest. In general the stones were of convenient size for carrying by one man, but larger stones were used in the circular walls. One measuring 3 by 2 by 2 feet and weighing probably 1,000 pounds was observed set in the wall at the height of 5 feet. As it is not possible for men to lift a stone to this height by muscular effort, it is probable that it was rolled to position on an earth embankment or a skid of poles. It will be perceived that men who could construct a circle with an accuracy that is comparable only with the work of men possessing instruments of precision would also show skill in masonry. In the course of the excavation the exterior of the acropolis wall was exposed for a length of 164 feet, showing masonry that excites admiration and surprise. (Plate 7.) Like all cyclopean construction, of which this wall is a type, the stones are rough bedded and not coursed. The wall is laid up with judgment, the joints broken, and large stones the width of the wall form headers. Occasionally a series of large stones forms what appears to be an attempt at a course. The stone are quarry faced, and projections beyond the line have been pecked away and a few petroglyphs cut on some of the stones. Some of the building blocks scattered over the ruin have fret and key designs pecked on the surface. The walls of the room interiors have in a number of cases where such walls were seen been carefully surfaced with the pecking hammer and the chinks set with small stones. Other rooms have been plastered with red clay; low doorways formed a means of communication between the rooms. In excavating the circular wall a very narrow entrance was found leading through it at the northeast.

As usual in the southwest, Forestdale is one of a group of pueblos, a member of which lies a few hundred feet to the northwest on the edge of the bluff. Another very large ruin is about one-half mile away on the line of the valley; a third, comparatively small, stands on the bank of the creek half a mile up the valley, and still another small ruin is on a sandstone cliff on the left bank. No detached houses were observed, nor were altars, shrines, or fire boxes noticed. The surface of Forestdale ruin shows traces of modern occupation, such as remains of foundations of Mormon houses, shallow basins marking the location of Apache wickiups, while on the acropolis circles of stones mark the

rifle pits thrown up during intertribal warfare among the Apaches some years ago. (See Plate 6.)

The débris surrounding the walls and obliterating the rooms is enormous in mass, greater than that surrounding any ruin in the Southwest known to the writer. This débris consists of ashes and charcoal mixed with bones, pottery, fragments, etc., which has altered the contour of the land around the pueblo to a marked degree. Pottery fragments are relatively fewer than in most other ruins, while bones of animals are quite frequent.

One cemetery lies on the east hillside, where a sandstone ledge crops out above the spring. This cemetery had been rifled by Skidi and others. The pottery secured by Skidi, he says, was sold to Mr. Schott, formerly agent at Apache. It is evident that burials were made at length in this cemetery, but the pottery, judging from the fragments, does not differ from that scattered over the ruin. There was no opportunity to ascertain whether cinerary burials occurred in this cemetery, but it was gathered from Skidi that such burials had been uncovered.

The collection secured by the Museum-Gates expedition at Forestdale was taken from a burial place along the free portion of the circular wall of the acropolis, marked in the plan. (Plate 3.) The burials here were from 5 to 8 feet, 2 inches below the present surface, and directly against the wall. Two varieties of interment were also encountered here, namely, a few bodies flexed and placed against the wall; the majority burned and placed in gray vases, which were luted with clay, stopped with a stone, or covered with an upturned bowl. A remarkable fact connected with the interments of this class is that the vases are usually set on the bones of an infant. No explanation derived from historical or present observances of any of the pueblo tribes can be given of this strange custom, which appears to have been of sacrificial character. It may also be said here that this is the most northerly occurrence of incineration that has yet come to notice. Fragments of a paho, painted green, were found on the ashes in one of these vases and a very much corroded mass of copper, which appears to have been a bell. Among the calcined bones were fragments of awls, showing that possessions were burned with the body. The ashes of a young person were inclosed in a bird-form vase. (Plate 8, fig. 1.) The flexed burials contained pottery, according to the general custom, the ware being red. Quantities of fragments of red bowls were thrown out of this excavation, and some fragments of cooking vessels in rugose ware, having wide, flaring rims, were seen.

The Forestdale pottery is red and gray in color, the red preponderating. It is found that the paste of both varieties is the same, the red ware being secured by covering the gray paste with a slip of yellow ocher burning to red color. The red ware is found in form of bowls, dippers, and small articles; the decoration geometric rain clouds and

terraced figures; the volute and key frets are missing. Several small objects of the highest artistic importance were collected. These comprise a paint cup of oblong shape (Plate 9, fig. 1), a handled vase, a small bowl, and a double bowl (Plate 9, fig. 2) of bright and lively red color; the designs geometric in black enamel, outlined with white and sometimes with black over a white ground.

The unique vessel formed by joining two bowls is remarkably attractive, even though broken. The potter has lavished on this object her highest skill, and the result is an achievement in polychrome ware which probably marks the highest attainment in ceramic art from the Southwest. We may follow the construction of this vessel with a view of explaining the processes involved. The potter formed two bowls of selected clay and joined them while "green" by a short neck connecting the rims. She then washed the vessel with fine yellow ocher and finished the surface with a smoothing stone. The interior of one of the bowls was washed with cream-colored kaolin and also smoothed with the stone. Having prepared her pigment for the black enamel, the basis of which is iron ore, but the secret of its mixing, whether with alkaline salts or resin, is lost, she skillfully laid on the interior of one of the bowls a geometric design and on the exterior rims of both various geometric frets, outlining the latter designs with stripes of pure kaolin. The interior of the second bowl required the preparation of a second color, which should burn to soft gray and melt into the background. The vessel was then fired, care being taken to prevent uneven firing and smoke blemishes. The result shows a knowledge on the part of the potter of materials, manipulations, and processes, from the selection of the clay to the last stages of firing, and a highly developed artistic sense in form and color that command our respect and admiration. That similar feelings toward the skillful potter were entertained among ancients of the Southwest is shown by a series of objects taken from a grave at Four Mile by the Fewkes party in 1897. Carefully placed in this grave were all the implements of the potter's craft, concave dishes, representing the beginning of the wheel in which the ware was set during manufacture, smoothing stones, a stone slab, and a mulling stone and grinder. Securely laid in a large, well-made cooking vessel, on a bed of pine twigs, were various kinds of clay and paints. Gourd formers and brushes of yucca strips, if any such were buried, had decayed. With these objects were specimens of excellent pottery. The purpose of this disposition seems clearly to furnish this venerated potter the implements with which she might continue her art for the benefit of the spiritual beings in the under heaven.

One piece of ware of the Gila type (Plate 10, fig. 1) and several fragments were all the examples of this type found at Forestdale. It is evident that the ruins on the north slope of the White Mountains

show strong Gila influence and are little related to the remains on the Salt River. One fragment of yellow ware with black and light-red ornamentation was picked up. The black on the specimen is thick and enamel-like. But one fragment showing white painting over a rugose surface rewarded the most careful search. Some fragments of ware resembling that of Four Mile have portions of designs of human figures in white kaolin. Symbolic designs are infrequent, birds, bear tracks, and a face on a red dipper comprising all such figures noted.

Gray ware.—Shards of gray ware are rare in the débris at Forestdale, so that the number of vessels found was to some extent unexpected. The comparatively small number of shards may be due to surface conditions, as in this region the ground is held by plants and moisture, while on the plains the prevalence of shards may be due to winnowing of several feet of soil by erosive agencies. The greater number of pieces of gray ware were vases of globular form (Plate 11, figs. 1 and 2), or of bird form containing incinerated bones (see Plate 8, fig. 1). None of the vases have handles as those from Linden and Showlow; one urn has an animal handle, several of which, broken from vessels, were taken from the débris. A few small bowls of gray ware were also taken out. (Plate 8, fig. 2.) A portion of a gray vessel bearing in relief apparently a snake, is an example of a class of decoration very rare in the pueblo region, but prevalent in Mexico and found sparingly on the Gila River. The bird-shaped vessels are more conventional in treatment than those found north of the divide in the drainage of the Little Colorado. Some figurines of animals in pottery, perhaps fetiches, occur at Forestdale. They are rudely executed and without decoration. A dipper with rattle handle came from this ruin. Rugose cooking vessels are few in number and of small size. Rounds of reground pottery are frequent; one such piece may have been a spindle whorl.

Stone.—The absence of metates from the surface, coupled with the presence of broken manos, was remarked at Forestdale, and it was learned that the former were carried off by Indians who make use of them around their camps, only working out a metate if an ancient one can not be secured. The Apaches also collect hammers and other stone implements from the ruins, which in many cases explains the paucity of such relics on ruins visited by them. While excavations brought to light metates, no axes and few hammers appeared, and arrowheads were infrequent. Chert flakes formed into scrapers and knives were numerous, one scraper chipped and ground being specially noteworthy. Chips of black and white obsidian and an occasional scraper of this material were noticed. A small boring implement of red chert is figured. (Plate 12, fig. 4.) A small paint pestle with traces of copper pigment on the rubbing end may be mentioned.

Pottery polishing stones, an arrow smoothing stone of Gila type, and a stone resembling a fetich (Plate 12, fig. 2) were taken out. The stone last mentioned has been carefully worked from a dark, greenish-blue rock much prized by the ancient people of the Upper Gila, numerous specimens having been found in Pueblo Viejo Valley^a where the material appears to occur *in situ*. Sporadic examples of objects cut from this stone are found north of the mountains, and one specimen was collected by Mrs. M. C. Stevenson at the Hopi villages. A small tablet of sandstone, having a design in black on one face, was excavated from this ruin. No conjecture is ventured as to the purport of the plan on the tablet, except to say that the ancients at Forestdale evidently drew circles as well as built them.

Shell.—Shell appears to have been little used at Forestdale, only a few pieces, consisting of wristlets and pendants, rewarding the searcher. The mountain pueblos are generally poor in shell, probably because they were off the routes of primitive commerce, or they may have had little to trade. Pueblos in passes through the mountains, as at Chaves Pass, must have been more in touch with aboriginal commerce, and in this case abundance of shell was found.

Bone.—The people of Forestdale made great use of bone. The most numerous bone objects were awls of various sizes and descriptions, with points at either end, with an eye like a needle (Plate 13, fig. 4), or merely pointed splinters of bone. One specimen has a figure like the letter X engraved on the sides, as seen on the ceremonial ax found at Cheylon.^b This was the only instance of ornamentation on bone observed. Cups formed by sawing off elk femurs near the ends are common, as at Pottery Hill. It has been suggested that these cups are rejects after the shaft of the femur was cut up into rings. The absence of such rings from the collection, and the finish of the lip of the cups, would seem to offer an objection to this theory, but the use of the cups is unknown. Rings cut from femurs apparently for the finger have been found at Chaves Pass. Wedges of bone and antler, numerous knives of deer rib, hide scrapers worked from deer pelvis, bone tubes, a bone with holes drilled through it (thought to be an arrow wrench), an ornament of antler in form of a bear's claw, and bones used in flint working were collected. (Plate 13.) The lower jaw of a deer from this ruin, with bands of red painted diagonally across it, is an interesting object.

Fragments of decayed wood were taken from the excavations, but it was not possible to ascertain whether they were worked. No cord or fabric of any description was encountered.

A large number of bones of animals were collected from the débris,

^a J. Walter Fewkes, Report, Smithsonian Institution, 1897, pl. xvii.

^b Idem., 1896, pl. XLVII.

where they occurred in great numbers. These have been ascertained by Mr. F. A. Lucas to belong to the elk, deer, antelope, dog, gray fox, mountain lion, wild-cat, beaver, turkey, and eagle.

It is apparent from the number of bones of animals that the Forestdale tribe were to a great extent meat eaters, and hence must have been hunters. The dog and possibly the turkey were domesticated. It would be interesting to connect the meat diet of the Forestdale people with their achievements as builders, but such theories must be advanced with hesitation.

Unfortunately, during the course of this exploration very few skeletons were encountered, and in these cases the bones were extremely decayed, so that no crania could be secured. From the fragmentary bones thrown out by the vandals who sacked the east cemetery it is obvious that adequate somatological material could have been acquired here. This is another example of the destruction of valuable scientific evidence by careless and unskilled hands.

The pottery of Forestdale bears a closer relation to that of Pinedale, north of the Mogollon Divide, than to any other ancient pueblo known to the writer. The bright red ware with black on white decoration is also found in a number of ruins along the mountains from Chaves Pass to Pinedale, reaching to within 40 miles of the Little Colorado and associated at Chaves Pass and Four Mile with yellow ware. The gray vases are not duplicated north of the divide; they will be found to belong to the Salt River Valley in all probability. The practice of incinerating the dead separates the ruin from any yet examined in the Little Colorado drainage.

On the whole, the Forestdale ruin is only one of perhaps a number along the head streams of Salt River, which is on the natural migration line from the south by which the Indians led Coronado to Cíbola. In the absence of information concerning the ruins it is not possible at present to make any approximate statement as to them. Forestdale may have been the stopping place of an important section of the southern element which tradition has it went to form the Zuñi or it may mark a southern extension of the Zuñi. The cremation of the dead also tallies with the Zuñi tradition that formerly they practiced the same custom.^a The burial against the house walls also reminds one of the Zuñi expression, "We bury our dead beneath the ladders."

The plans of the old Zuñi ruins figured by Mindeleff in the Eighth Annual Report of the Bureau of American Ethnology show that Nutria is a circular pueblo and that Pescado, so far as the ancient plan can be traced, approached a circular outline. Kintiel, which is a Zuñi ruin, and several of the ruins of the Canyon Butte group north of the Petrified Forest are of this type.

^aCushing, Zuñi Creation Myths, Thirteenth Annual Report of the Bureau of American Ethnology, p. 336.

Zuñi archeology still awaits an explorer who will do as much for it as has Fewkes for the Hopi. A vast and untouched field lies south of Zuñi, and complex migration problems cluster around the headwaters of the Gila, Salt, and Little Colorado rivers. In much of this region, on account of the work of untrained explorers and curio hunters, it is too late to do more than secure what they have left or to trace the material to private or museum collections for the purpose of study.

INTERIOR SAWMILL.

Leaving Forestdale a reconnaissance was made to Fort Apache, following the road south from Cooleys. A cave in a lava bed near Interior Sawmill was examined, but no evidence of occupation found. A short distance from the Interior Sawmill a small pueblo yielded on excavation a few pieces of gray ware, a large flaring bowl in fine coiling, a stone hammer (Plate 14, fig. 1), a bone tool splendidly engraved (Plate 14, fig. 2), and a skull. Farther south along White Mountain River a number of rectangular pueblos were seen, but no excavations made. From the surface relics these ruins appear to be poor and the pottery, gray, red, and coiled, of inferior quality. Having secured photographs and ethnological data from the Apaches and made botanical collections, the party returned north, excavating for half a day at Snowflake, where a small ruin yielded a few pieces of gray and red ware and a skeleton.

LINDEN.

Near Linden, Navajo County, Arizona, some 45 miles south of Holbrook, there is a large ruin, locally called Pottery Hill, lying on the north side of the watershed near the divide between the Salt and Little Colorado rivers. This part of the White Mountain Plateau presents a series of beautiful park-like expanses between low ridges, well grassed and studded with large pines and clumps of stunted oaks. At this elevation in the White Mountains the humidity is sufficient in favorable seasons to admit of dry farming. Stock raising and dairying is the main occupation of the people. The soil, formed by the decomposition of carboniferous sandstone, limestone, and shales is fairly rich. Vegetation is abundant; after the summer rains and the melting of the snow in spring myriads of flowers appear.

It will be seen that the environment would be favorable to the maintenance of the prehistoric people who lived here, furnishing wood for fuel and construction, useful plants, clay for the potter, and stone for the builder. Game abounded and wild bees yielded honey. In this locality, however, there are no springs, the water sinking and necessitating at present its impounding in ravines. A few wells have been dug at Linden, but the water is scanty and unpalatable.

The ruins (Plate 15) are situated on a ridge bounding the southern

side of one of these parks. The main site covers the lower end of the ridge lying with its longer axis north and south. On the east the ruin slopes down to the valley by a series of terraces and on the west to a shallow draw. Its outline is oval, measuring 228 feet in length by 150 feet in width. The cemeteries lie to the east and to the west of the pueblo and to the northwest is a shrine among the rocks, consisting of a pile of fossils and iron concretions of peculiar shapes.

Detached rectangular ruins occur at intervals in the juniper and pinyon woods at the northwest along the margin of the gradually ascending ridge extending perhaps 1,500 feet. Aged junipers grow in these ruins and the remaining building stones show extreme weathering. No trees except some young junipers grow on Pottery Hill, giving the impression that this ruin was occupied at a later period than the others in the vicinity.

Another interesting ruin of the Linden group, lying in the forest 2 miles west of Pottery Hill, shows a rectangular plan 45 by 72 feet, containing 12 rooms, and adjoining is a circular-house plan 65 feet in diameter, having a passage through the wall to the central court. (Plates 16 and 17.) There was little débris, and excavations were without results. Stumps of pine trees that had matured and decayed were found in place in the rooms. The plan of the ruin is instructive when compared with that of Forestdale, which also presents circular and rectangular features.

No walls are standing in the Pottery Hill ruin, and heaps of sandstone blocks from the houses, interspersed with fragments of pottery and broken implements, cover the surface. A reconstruction of the pueblo would show a long line of houses perhaps two stories in height, facing both ways, on the slopes of the hill, and below this successive rows of houses, forming terraces. To the east there were three or four terraces and to the west one or two. No detached houses or fire boxes were observed. Such walls as were uncovered during excavation were formed of oblong blocks of rough-faced sandstone laid with little skill. The débris of house refuse is enough to show lengthy occupation of the site.

The principal cemetery is in the débris on the west side of the pueblo some distance from the walls. Most of the graves had been rifled during the summer of 1900 by dealers in curios from Pinedale, but more systematic excavation brought to light a number of specimens. Owing to the strong nature of the soil few pieces of pottery were taken out unbroken.

A feature concerning the deposit of the dead in the graves at Linden such as the packing of stones and clay around the body, especially near the head, leads one to suppose that the device was to prevent burrowing animals from entering the sepultures. This mode of burial accounts for the destruction of the pottery when the earth sank and

packed in the graves. The burials were at length with no regard to the points of the compass, and no stakes were placed over the bodies as at Chaves Pass, nor were stone slabs found as in the ruins along the Little Colorado River. No traces of matting or other textiles were observed. The skeletons were mostly decayed beyond preservation. Bones of elk, deer, antelopes, turkey, and of small mammals and birds were numerous.

In the undisturbed cemetery to the east similar conditions obtained, but the majority of the specimens came from this point. A burial here was noteworthy in that two bodies were interred together, the skeleton of one is in fair condition, the other merely vertebræ, ribs, and scapulæ. The place where the skull should have been found was covered with an inverted bowl containing ashes, and no fragments of the skull were present. As a rule the pottery was deposited near the head; when a number of pieces were found they were laid along the body. In one grave as many as 12 pieces had been buried. No pahos or fetishes were found in the graves.

The finds at Linden include some interesting specimens of pottery of several classes. Gray ware is represented here principally by gray vases with spherical body and tubular neck, having a curved handle from the rim to the body (Plate 18, figs. 1-3); cups with handles; bowls with close zigzag ornamentation covering the interior (Plate 19, fig. 1), and canteens of good form and ornamentation (Plate 18, fig. 4). The bowl of fine gray ware delicately coiled on the exterior, and with a well-designed fret pattern forming a band around the interior wall, is a remarkable and unique specimen (Plate 18, fig. 5), no rugose vessel of the gray ware having been hitherto described to the best of my knowledge.

Another noteworthy specimen is a gray bowl with interior ornamentation of human and animal figures. (Plate 19, fig. 2.) Around the side of the vessel a herd of deer run in single file below a grotesquely drawn human figure in attitude of surprise, and in the bottom of the bowl is drawn a large mountain lion. Apparently there is no symbolism involved in the design. The intention of the artist evidently was to portray in a realistic manner some actual occurrence, probably the encountering of a herd of deer pursued by a mountain lion. Fragments of pottery showing portions of composition have been picked up on ruins along the north slopes of the White and Mogollon mountains, indicating the use of such designs, but whole specimens are exceedingly rare. The bowl in question was in many fragments when found.

Some bowls of coarse red ware with interior geometric ornamentation were taken out at Linden. They resemble those of Showlow and other ruins yielding gray ware. One well-made bowl (Plate 20, fig. 2) has straight sides, and on the exterior is a stepped design with white

border. The interior is undecorated. The edge bears black dots, a feature often noted in the ware of the mountain ruins.

Small cooking pots of coiled ware and small coiled vases occur at Linden. Great quantities of fragments of large flaring bowls with polished black interior and rugose exterior bearing volutes and grecques in white lay around the skeletons. Often five or six of these large bowls were nested in a grave, and, as may be imagined, the sinking and packing of rocky soil upon them produced such havoc that it was not possible to save fragments enough to reconstruct a specimen of what was evidently beautiful ware. A small globose bowl of this type was preserved intact. (Plate 20, fig. 1.) Among the small pottery objects from Linden are reground disks and small dippers. Fragments of vases and bowls with birds and the widespread four bird convention and a fragment of gray ware in form of a mountain sheep's head were picked up. A red bowl with the two joined bird symbol on the interior must also be noticed.

Rude axes and hammers, a fragment of an arrow-smoother of Gila type, a chipped chert implement resembling a pick, a flint chisel chipped and ground, a pitted stone, pottery smoothers, arrowheads, and flint and obsidian knives comprise the collection of stone implements from Linden. Ornaments of stone were a few large beads, disks, and tablets of red stone. Two cylindrical sections of fibrous selenite of unknown use were found in a grave. The stones from the shrine were iron concretions in form of cups, spheres, and odd shapes resembling birds, etc., fragments of red jasper, and a mass of fossil coral (*Syringopora multattenuata*). This was the only fossil observed; on the hill above a vein of Carboniferous limestone made up of fossils was seen and a number of specimens were collected.

Shell is very scarce at Linden; the objects of this material taken out were fragments of bracelets of pectunculus and a spiral shell ornament, *Turitella tigrina*, from the Gulf of California.

Bone was more frequent, consisting of awls, leather-working tools, scrapers, flint-working tools, punches, and other implements of antler. A number of antlers were taken from the excavations. Cups of elk and deer femurs similar to those found at Forestdale occur at Linden.

No fragments or traces of fibers or textiles were encountered.

The collection of bones of animals turned up during the excavation is found by Mr. F. A. Lucas to include the following: Antelope, elk, dog, jack rabbit, and turkey. But one complete human skeleton could be saved, the bones in most of the interments being in fragmentary condition.

Linden presents points of similarity with the Huning ruin at Showlow, best characterized by the rugose ware with white decoration, a type to which attention was first called by Bandelier in 1883. The range of this type is not clearly defined as yet, but the explorations of

the season of 1901 give localities at McDonald's Canyon and the Petrified Forest (see pp. 305, 314). One specimen each from Four Mile and Cheylon are figured by Dr. Fewkes.^a It must be said, however, that the occurrence seems to be sporadic at the sites mentioned and that the locality of greatest prevalence so far as known is at Linden. There is no doubt that this ware belongs on the northern slope of the White Mountains.

SHOWLOW.

A large ruin on the ranch of Mr. Henry Huning, at Showlow, was worked by the Museum-Gates expedition for a few days beginning July 12. Mr. Huning informs the writer that the ruin was examined by Mr. A. F. Bandelier some years ago.^b The pueblo is located on a rock table a few feet above the level of Showlow Creek, which irrigates the wide and fertile valley forming part of the Huning ranch. The layer of débris is thin; hence the plan of this ruin is somewhat easy to make out. (Plate 21.) Much of the stone has been removed for buildings, and during this process a room at the south end of the pueblo was found to contain a large amount of charred corn, beans, etc. The cemetery was located on the east side in front of one of the piers; there were few interments, and only a small collection was secured.

The pottery is of red and gray, the latter presenting some rather good pieces, a dipper with rattle handle being noteworthy. The red ware is not fine and the decoration not well executed. Rugose bowls with volutes of white were frequent, though in fragmentary condition. Bone awls and a worked deer femur were found. Notched flints, a stone ax, an arrow smoother, scrapers, arrowheads of obsidian, and a large chipped flint leaf form comprised the relics in stone. A bit of the clay as rolled out by the potter in the process of coiling a vessel was taken from the débris.

The scarcity of potshards on the surface of this denuded ruin was remarked, and reminded one of the absence of such relics from the Zuñi ruins, where the shards have been picked up by the modern potters to be incorporated, after pulverization, with the clay for vessels. One perfect skeleton was secured. Bones of dog, two species of rabbits, turkey, and deer were collected.

The Huning ruin is a good example of the rectangular pueblo, showing considerable skill in laying out a village. The masonry exposed during the excavations is good; the material is of blocks of Carboniferous sandstone.

It seems probable that the pueblo was inhabited only for a short time. The artifacts resemble those excavated at Linden, some 8 miles to the northwest.

^a Report, Smithsonian Institution, 1897, pl. II; idem, 1896, pl. XLII.

^b Papers, Archæological Institute of America, IV, Pt. 2, p. 393.

SHUMWAY.

Near the town of Shumway, 40 miles south of Holbrook, on the banks of Silver Creek, a ruin of some importance was hastily examined while the party was on the way north from Showlow. The ruin consists of a long house group, two rooms deep, and a parallel house group having a wing at right angles at one end, and between these groups is a plaza (Plate 22). The rear house mass forms a high mound of debris from the two stories of this part. The cemetery lies in a sand bank near the walls of the front row of the houses, facing the creek. The graves had been rifled the summer before by a "pottery digger," who sold his ill-gotten gains at Holbrook. It is presumed that the specimens are in a collection purchased at Holbrook in 1901 by the Free Museum of Science and Art of Philadelphia. A number of fragments, sufficient to show the quality and character of the pottery, were picked up on the excavations. The pottery is fine yellow and red, and the decoration is like that of the ancient Hopi pottery. The fragments show that symbolic designs were common on the interior of the bowls.

LITTLE COLORADO VALLEY.

MCDONALDS CANYON—SCORSE RANCH—CANYON BUTTE—ADAMANA—METATE—WOOD-RUFF—MILKY HOLLOW—STONE AXE—SMALL SITES NEAR STONE AXE.

MCDONALDS CANYON.

On the day of my arrival at Holbrook some Mexicans brought in 58 pieces of excellent pottery from ruins 22 miles southwest of that place, in McDonalds Canyon. (See general map.) It was ascertained that there were a number of ruins perhaps worthy of examination in the locality whence the specimens came. Hiring a small force of laborers and getting together a camping outfit, on May 4 we camped by the ruins, 11 miles from nearest water.

McDonalds Canyon is the name for quite a scope of country among the ascending Carboniferous ridges flanking the White Mountain Plateau. The dry wash leading into the Little Colorado, between Holbrook and St. Joseph, which heads back in the mountains, has numerous branches, so that the country is broken by canyons of no great depth, sometimes expanding into wide, level barrancas, becoming in wet seasons lakes. The ridges, deeply covered with yellow sand and clothed with junipers, present a most desolate aspect. The environment is hostile as to food and water, as the party experienced. In the seasons when rain falls, water is impounded in the natural tanks, but does not last long under the extreme evaporation at this altitude—5,400 feet. In one case a stone wall had been thrown across a canyon for the purpose of impounding water, a piece of engineering rare in this portion

of the Southwest, and at present the dam is effective, this source of water being the last to fail. Much of the present forlorn appearance of the country is caused by range stock.

The ruins, five in number, are located on sandy ridges from 1 to 2 miles apart. They exist as inconspicuous elevations and are very difficult to find amidst the maze of ridges. All the ruins of the group are rectangular in plan, the rows of houses surrounding a plaza the entrance to which is from the east. There were no detached houses. The largest ruin is typical of the group (Plate 23). It evidently had a two-story house of large dimensions at the northeast corner. Judging by the amount of débris, the other houses of the village were one story in height. A circle of stones lies to the southwest.

The house-building material is coarse yellow Carboniferous sandstone laid in gypsum, which is abundant in the formations of this region. Smooth floors of the same material and slab floors were observed in some of the rooms. Beneath the corner of the high house of Ruin 1 a number of small white quartz concretions had been placed, apparently in dedication of the structure.

The débris is sufficient to indicate the occupation of these villages for a somewhat extended period, perhaps two generations. Bones of antelope, deer, dog, wildcat, and rabbit were found in the débris.

The cemeteries lie to the northeast of the village, close to the walls, and contained numerous interments at a moderate depth, the bodies laid at full length, generally to face the east. The grave of a child containing several mortuary vessels was found under the floor of a house. No grave slabs were discovered, and the burials near the walls were poor in pottery. The character of the soil is such that no incrustation of mineral matter was deposited, so that the specimens came out in unusually good condition. Twenty-three crania and portions of skeletons were collected. Though these ruins had been sacked, I was able during part of three days to collect over 100 specimens, many of which had been left as unimportant by the workmen, who only seek the marketable pottery and trinkets.

By good fortune the Bureau of American Ethnology was able to purchase from H. H. Scorse the valuable pottery previously collected here and from two other localities north of Holbrook. Thanks to this these specimens now in the National Museum supplement those collected by the writer and will be described with them in the following pages.

Seventy per cent of the ware at McDonalds Canyon is black and white, the "gray ware" so widespread in the Pueblo region, and the remainder is of red and coiled ware. The gray pottery from McDonalds Canyon presents some of the finest specimens of this ware in existence. The bowls are large and perfect and the decoration forceful, showing the touch of a master hand. The largest bowl (Plate 24, fig. 2) has a

band of geometric pattern around the side leaving a circular field in the bottom. This pattern is made up of bird forms. The bowl is ovate in outline, 13 inches in diameter and $6\frac{1}{2}$ inches deep. The pigment has burnt to a soft dark brown. A second bowl (Plate 24, fig. 1), also ovate in outline, has a series of frets of derivative bird forms and lines of hour-glass figures which are also a conventionalized form of two birds placed feet together with heads in opposite direction. The design is arranged in four wedge-shaped areas leaving a square field in the bottom of the bowl. This bowl is 13 inches in longest diameter and $5\frac{3}{4}$ inches deep. Another bowl (Plate 25, fig. 2) of large size bears on the interior a bold and striking design of interlocking hooks arising from pyramidal bases. These are birds and the effect is to produce a running key pattern outlined in black. The design, like that of Plate 24, fig. 1, is in four wedge-shaped sections outlining a square field in the bottom of the vessel. The color used is a rich, glossy black; the specimen is fresh and in perfect condition (diameter, $11\frac{1}{2}$ inches; height, 6 inches). Still another large bowl (Plate 25, fig. 1) from this group of ruins belongs with similar specimens from the north. Almost identical pieces were found at Scorse Ranch (see p. 308), and W. H. Holmes figures one from Tusayan.^a It is more than probable that this splendid bowl was secured by barter from the people of lower Le Roux Wash. The arrangement of the design is like that of the last-described bowl and the outline is more symmetrical. Several other gray bowls show resourcefulness and manual skill in decoration that mark all the specimens from this locality. Gray vases of good form, with handles, are next in frequency after the bowls. These comprise the list of forms in gray ware. The vases are of different sizes from very small to those holding upward of a quart. The small vases are as carefully decorated as the larger and it is probable that they are connected with ceremonial usages as the little sacred water vases of the Hopi.

Attention may be called to a vase of excellent form and decoration. (Plate 26, fig. 2.) The design is made up of horizontal bands inclosing two running scrolls; the motive, birds with interlocking beaks. Four groups of four vertical lines are arranged on the rim, resembling the Pueblo rain symbol. The black pigment has a remarkable luster, unlike that of any specimen known to the writer. A vase, probably of idealized bird form, was taken from these ruins. (Plate 26, fig. 1.) The surface design in red-brown has become obscured by weathering, but enough remains to show that it represents feathers.

The red ware consists principally of small bowls and dippers of friable paste. The surface is polished and decorated with geometric designs. The small canteen (Plate 29, fig. 1) is a beautiful object from

^a Pottery of the Ancient Pueblos, Fourth Annual Report of the Bureau of American Ethnology, p. 323.

its elegant form, high polish, and varying shades of red, like a ripe apple. A small vase decorated with spirals in white (Plate 29, fig. 2) is also an attractive object. With the red ware may be classed bowls of rugose ware with polished black interior (Plates 27 and 28, figs. 1 and 2) and a geometrical decoration in white over the rough exterior. The design reminds one of those on basketry and, taken with the rugose surface, is suggestive of the origin of this type of ware. A number of rough cooking pots of coiled ware, usually rather small, are in the collection from these ruins.

The only bit of relief modeling noticed is a small fragment bearing a rudely formed human foot.

It was noticed that worked stone axes and hammers are absent from the McDonalds Canyon ruins, their place being filled by spalled quartzite boulders and cylindrical battering hammers of quartzite and jasper. One boulder of natural form has two finger holes pecked on opposite sides. Pottery polishing stones, chert arrowheads, and knives are somewhat common. Flat metates and manos were present.

A pectunculus shell carved in the shape of a frog and bearing evidence of having been once incrustated with mosaic was found. Such specimens are rare. Dr. Fewkes figures an incrustated shell frog from Chaves Pass^a and a plain carving from Cheylon.^b A few beads of shell or stone were collected at McDonalds Canyon.

Some awls and a wedge-shaped object comprise the worked bone secured in these ruins.

No remains of textile were observed. The house refuse shows bones of turkey and deer few in number. Charred corn was also taken out of the excavations.

Pahos and fetishes, except the stones found under a house corner, were not seen.

The crania nearly all show the flattening of the occiput so common in the Pueblo region. From the somatological series procured at McDonalds Canyon it will be possible to make a contribution to the affiliations of the inhabitants of these pueblos.

In September, after the close of the Museum-Gates expedition, the writer spent some time in examining and mapping two groups of undescribed ruins north of Holbrook on the Le Roux and Cottonwood washes at the Scorse Ranch and near Biddahoochee, respectively.

Le Roux Wash extends southwest from the Navajo Reserve, near the New Mexico line, about 100 miles to the Little Colorado at Holbrook, Arizona. There are two branches, one called Pueblo Colorado Wash, heading on the 8,000-foot contour near Zilh Tusayan Butte, and the other heading northeast of Old Fort Defiance. The valley is wide and sandy, and on account of the large drainage area the water from

^a Report, Smithsonian Institution, 1896, p. 529.

^b Idem, p. 535.

local storms in the basin is distributed for long distances; not infrequently the wash "runs through." Because of the water and of the fact that the bed of the wash offers numerous places where the water overflows wide areas of sand, forming ideal locations for Indian corn-fields, the movements of migrating clans have been along Le Roux and Cottonwood washes rather than along the Puerco and Upper Little Colorado with their swift current. The prevalence of ruins along the Le Roux Wash is in accordance with the conditions noted. The better-known ruins are those at Ganado, Kintiel, and Tanner Springs, and to these we may add the group under consideration.

Along this migration route the gray and red ware in northern forms of the San Juan have been carried south and west to the Little Colorado far into Tusayan. It is probable also that the migrations extended into the White Mountain plateau and are responsible for some of the sites furnishing gray and red ware, as at McDonalds Canyon. It must be said, however, that the characteristic San Juan forms thin out in the western part of the White Mountain region, while on the lower Le Roux they exist in entirety.

SCORSE RANCH.

The Scorse Ranch ruins lie on the south side of the Le Roux Wash, in the broken country along the north flanks of the Holbrook mesa, at a distance of from 16 to 20 miles north of Holbrook. (Plate 30.) They extend from the "X" Ranch to the Scorse Ranch, a distance of about 4 miles. Small sites are also found at the level of the valley, but it will be seen that the larger pueblos were hidden in the hills, where there is building material at hand. Small house ruins are found near the base of the X Ranch Butte. This strangely formed mass of black lava has nests of predatory birds on its summit, and the house sites may have some connection with eagle ownership or they may have been field houses. The bed of Le Roux Wash always contains water, which may be had by digging a few feet below the surface. Wood is scarce; a few cottonwoods growing along the wash and a small clump of junipers on the mesa form the only trees to be seen. Desert vegetation, such as "rabbit brush," *Bigelovia graveolens*, *Atriplex argentea*, etc., is relatively abundant and furnishes fuel to those who camp there. Clay is plentiful, and stone exists near the top of the mesa, where deposits of Triassic fossils and petrified wood were seen, one pueblo having been built of the last-mentioned material.

The ruins are rectangular, displaying no characteristics of plan worthy of remark. No walls stand above the surface, and the condition of the sites gives one the impression that the pueblos have been abandoned a long time. In general the pueblos face the valley without uniformity as to orientation, nor do the cemeteries appear to have

been oriented, the burials being located around the villages wherever a suitable spot could be found.

The houses were constructed of small irregular blocks of Triassic sandstone laid up in the usual way and were probably in the main one story in height. Débris around the villages is abundant.

It is not possible to go into detail concerning the method of burial practiced in these ruins, as the cemeteries had been rifled. From observation of the excavations it was gathered that burial slabs were used, that the ground is full of charcoal and ashes, and that some of the skeletons were well preserved. My guide, who had worked the ruins, informed me that almost no shell, turquoise, or beads were present.

A portion of the specimens went to the Watron collection, purchased by the Field Columbian Museum of Chicago, and the subsequent collections were, on the writer's recommendation, purchased by the Bureau of Ethnology. On this interesting collection the description of the artifacts of the Le Roux Wash ruins is based.

The Scorse Ranch collection numbers 175 pieces of pottery. Of these 43 per cent are of gray ware, 20 per cent undecorated brown ware with polished black interior, 18 per cent coiled cooking pots and coiled vases, and 14 per cent of red ware. The remaining per cent consist of a few miscellaneous pieces not classified.

The forms of gray ware in order of prevalence are: Vases with handles (41); bowls (23); globose vases (7); canteens (5); bird-form vessels (4); cups and dippers, of which there is 1 each. The brown ware with polished interior is: In the form of bowls (26); dippers (5); cups (1); and vases (1). The red ware: Bowls (12); vases (5); jars (4); cups (1); globose vases (1). The coiled ware consists principally of cooking pots, and with this class are a number of small, finely coiled vases of ceremonial use. One fine bowl of red ware with rugose surface was found.

Gray ware.—The texture of the gray ware is coarse, and in some cases the paste is so dark that it has been necessary to cover the vessels with white slip. The surface is roughly finished, and the marks of the smoothing tools are easily seen. The color used in decoration is black.

The variety of forms in gray ware is in keeping with the abundance of this class. The handled vases show considerable diversity in shape, from a simple bottle form to the typical vase form with neck and shoulder. (Plate 31, figs. 1–6.) Some of the vases resemble rude pitchers. In size these vessels range from 2 to 10½ inches in height. The rounded bottoms and heavy handle at the neck render these vessels unstable like the ancient tumblers.

Another purely northern form is the globular bowl. (Plate 32, fig. 6.) These are usually in gray ware, but sometimes in plain red. The

first specimens of this form in the National Museum were collected by Dr. Edward Palmer from an ancient pueblo at St. George, Utah. They are always thin and well made. The vessels in form of canteens are also skillfully made and well decorated. (Plate 32, fig. 5.) They are small to be used for carrying water compared with the canteens in use at present. This form, which is of rather wide distribution, is found in the ruins of the gray and red type in the White Mountains, as well as on the Rio San Juan.

The bowls of gray ware range from crude specimens with flat bottom, straight flaring sides and simple decoration, to those displaying a degree of taste. One of the more interesting bowls has a remarkable design of unknown meaning. (Plate 34, fig. 2.) Another shallow bowl has a decoration representing a horned snake with two heads. (Plate 34, fig. 1.) The design on a third bowl consists of two bands of the bird pattern in waved lines. (Plate 33, fig. 1.) This pattern is found at McDonalds Canyon. (P. 304.) A bowl with precisely drawn decoration shows bird figures in an extreme stage of conventionalization. (Plate 33, fig. 2.) This bowl apparently has been intentionally bent into its present shape; other bowls so bent have been found in the White Mountain region. A small bowl from this location is the only one having decoration in brown pigment. The vessel is in good condition and resembles Zuñi work. Another bowl has a design in the center of the field in the bottom formed of crossed lines over concentric circles. This is the only vessel from these ruins bearing symbolism in this manner.

This collection has a number of bird forms in gray ware. (Plate 32.) One very good specimen (Plate 32, fig. 1) has a loop at the tail of the bird for the passage of a cord; the head of the bird is missing and with this portion the other loop. The arrangement of the decoration into several fields is a conventionalization of the bird topography. The small vase (Plate 32, fig. 4) is interesting as showing both bird form and surface decoration of bird elements. A small rude vase of bird form has a decoration of feathers around the neck. (Plate 31, fig. 3.) Another undecorated vase is closer to the bird form and bears wings in relief on the sides. (Plate 32, fig. 2.)

Of the brown ware with polished black interior there is little to say, except that the bowls are distinctly conical. This ware should be considered a variety of red.

The red ware consists mainly of soft earthenware bowls with polished surface and geometric line decoration on the interior. (Plate 35, fig. 1.) The bowls of harder paste have exterior decoration in white (Plate 35, figs. 2 and 3) like those of Canyon Butte (see Plate 47). So far as known at present, the distribution of this type of decoration is coincident with the range of tribes of Zuñi culture. Thus, specimens have appeared at Kintiel, Navaho Springs, Petrified Forest, Scorse

Ranch in northeastern Arizona, and in the St. Johns region extending south of Zuñi, New Mexico. Presumably the rugose vessels with kaolin decoration centralized at Showlow and Linden belong to a separate class more limited in distribution. A small red vase with finger sockets (Plate 36, fig. 1) is noteworthy as is a specimen ornamented with concentric marks made with the finger nail (Plate 36, fig. 3). The handled vases (Plate 36, figs. 4 and 5) in red resemble similar gray forms. One of these is covered with red slip over gray paste. Great taste was displayed in coiling. (Plate 36, fig. 2.)

Some stone hammers grooved for the reception of a handle and a few basalt axes of good form and elegant finish (Plate 37, figs. 1 and 2), are in the collection. The implements of chert are leaf-shape knives, arrowheads, and drills. There are mortars with pestles of coarse sandstone and lava. (Plate 37, fig. 3.) A well-worked stone ball and two tubular pipes of lava (Plate 52, figs. 1 and 2) were taken from these ruins. But one object of shell, a valve of a clam, is included in the collection.

The pottery from Le Roux Wash has a crude appearance, due to lack of finish and skill in decoration. Without doubt there was an attempt to execute forms of some complexity and difficulty, but the result is rarely praiseworthy.

CANYON BUTTE.

This group of four ruins lies close to the northern escarpment of the chief basin of the Petrified Forest, at the source of a wash flowing southwest and entering the Little Colorado at Woodruff (see map, Plate 38). The country is high and rolling, sloping west and south from the rim of the Puerco Valley, which stands about 2 miles north of the ruins. The ridges are of tinted Triassic marls covered with wind-drifted sand, and sometimes sandstone ledges bearing a few stunted junipers crop out.

On May 9, when camp was made on the ruins, the country was well grassed and numerous desert plants had sprung up after seasonable rains, but no water was to be had nearer than the well in the wash at the "Jim Camp," in the Petrified Forest, about $2\frac{1}{2}$ miles away. There are no springs in this region, the water sinking quickly and flowing in underground streams.

It is probable that the people inhabiting these pueblos in former times impounded water in tanks in the marl which underlies this region. Sagebrush is the only available firewood, the few junipers being inaccessible along the rocky mesa sides.

In great contrast with the basins of the Petrified Forest the neighborhood of the ruins shows few evidences of erosion; hence the pueblos have been little disturbed and appear as low, weed-grown mounds strewn

with fragments of pottery, house stones, and other débris. The location of the group was known by two or three cattlemen only who had ridden over the site, and to this fact is due the preservation of the remains from the vandals who have ransacked the ancient pueblos of the Southwest for a number of years without let or hindrance. The environment at present is quite hostile, and there is no evidence that there has been any great change in the climate for centuries. Clay and stone are abundant, but the scarcity of food animals and plants, firewood, etc., coupled with the lack of water, render it somewhat of a mystery why the people primarily located in this region. It is probable, however, that the juniper forest formerly spread more widely over this section where areas of it now exist, having escaped the great denudation in progress. It has also been thought that a progressive desiccation is taking place in the Southwest; no observational data is at hand to substantiate this theory, and the generalization perhaps arises from the cycles of dry and wet years that have been noted by settlers in the country.

All the Canyon Butte Wash ruins face the east, the houses at the back of the pueblos having been two or more stories in height. The plan of the ruin varies; one is semicircular, another is ovate, another is rectangular, with one rounded or stepped corner; the remaining one is rectangular. The materials are small slabs of Triassic sandstone laid in mud, and the masonry shows little skill in breaking joints and tying corners. The exterior walls are 10 inches thick; the walls between the rooms 7 inches thick; the floors of stone slabs; the rear wall was plain and perhaps without openings. The rooms average about 7 by 10 feet in floor area, a size rarely departed from in the Pueblo region.

The cemeteries are northeast of the village at a short distance from the house walls. The dead were laid to face the same point of compass and covered with slabs of sandstone placed slanting over the body at a depth of from 2 to 7 feet. Detached house sites, altars, fire boxes, etc., were observed near the ruins. The débris of house refuse is considerable in amount, and yields bones of the rabbit, dog, turkey, rodents, and antelope.

In detail, the results of investigations of the ruins are as follows:

Ruin No. 1 (Plate 39), the most important of the group, is semicircular in outline, two rooms deep, the mound standing high at the back, indicating a terrace story. In the center of the court, near the house walls, is a depression about 20 feet in diameter. There are also traces of constructions in the court, which slopes down to the opening. To the northeast, in a low elliptic mound of house refuse, is the cemetery. Near the southeast end of this mound is a flat circular area having a heap of concretions and stones of odd and suggestive shapes and colors. Some of the stones are worked cylinders and spheres. Numerous tubular pipes of lava were scattered among

the stones, and near the altar is a fire box lined with slabs and filled with calcined fragments of volcanic rock. Three small house sites are located to the east of this ruin. Near the southern house a single burial was discovered, containing four pieces of pottery, some shell beads, and a few turquoise pendants. Near the northern group of houses and at the south end of the main pueblo are fire boxes of the usual form.

The distribution of interments in the cemetery brings out the fact that the area at the end of the mound due northeast of the pueblo contained the remains of the well-to-do members of the tribe placed deep in the ground and surrounded with valuable things, while on the outskirts the poor were buried in shallow earth without slabs and with only a broken vessel or a fragment beside them, the part standing for the whole. An interment in the favored spot may be described as typical of a burial of the better class. After removing the surface soil, clean earth was encountered intentionally mixed with fragments of charcoal. This earth was quite dry and solid and, had not charcoal been present, might have seemed unfavorable. At 6 feet upright stone slabs were encountered, and these being disengaged and lifted out were found to cover a rectangular cist, at 7 feet, cut out in the side wall of the excavation, and the marks of a wedge-pointed tool, probably a digging stick, were preserved in the hard white marl. The cist contained a skeleton at length, and with it were hundreds of small beads of calcite and olivella shells, a shell bracelet, a bone awl, fragments of pahos and matting, and nine pieces of pottery, some of them remarkably fine and unique as to decoration. (See Plates 48, 49.) Fragments of eagle eggshells were also taken from this grave. In another burial a rod of wood extended the whole length of the grave. The wood was decayed, but the object was evidently a bow. In the cemetery awls of bone, spherical hammers of chalcedony, arrow-shaft smoothers, and smoothing stones were encountered. Metates were few in number. The absence of worked stone axes and the scarcity of arrowheads was notable. Beads and ornaments of stone and shell, iron and copper paint were common. Corn, squash seed, fragments of matting, coiled basketry, and cord, the latter apparently of yucca fiber knotted, were secured from ruin No. 1. An interesting tablet of sandstone, having a rain-cloud design in black drawn across the face, was excavated from the cemetery. Such tablets are rare. (Plate 42, fig. 2.) The pipes or "cloud blowers," twelve in number, from the shrine are fine examples of stonework. (See Plate 52, figs. 7-9.) An awl made of hard, dark wood with carved head, from this cemetery, is unlike any other known to the writer. From a grave near the concretion shrine the skull of a dog was taken. The pottery, which was abundant in this ruin, will be considered with the finds from the whole group further on, as will also the osteological remains.

Ruin No. 2.—Two hundred yards southwest of No. 1 is a small rectangular ruin (Plate 40) facing a little south of east, the mound higher on the west. The stone is gray Triassic sandstone, brought from buttes 2 miles distant, and the masonry is similar to that of No. 1. The cemetery is on the east side and is small. A few graves exist on the bank of the wash to the west. The graves are deep, the ground rocky, and little pottery was placed with the dead. The ware is identical with that from other ruins of this group. A necklace of graded pectunculus shells with carved pendants was taken out. Chalcedony hammers, smoothing stones, a small mortar of red granite, and grinding stones were picked up on the surface. A fire box was located in the corner of the rectangular court. Seventy-five feet from the ruin is an altar located on a sand ridge. It consists of two bowlders set together near a section of fossil wood, *Auricaryoxylon arizonicum* Knowlton, brought from the neighboring forest. One bowlder is of red granite, 16 inches in diameter, and the other a spherule of dark sandstone, 9 inches in diameter.^a

Ruin No. 3.—Second in importance and in some ways more interesting than the others of the group is ruin No. 3, located on a rocky escarpment above a basin several hundred feet deep, excavated in the red marl. The ruin occupies a prominent position on a level rock platform, and the mound is better defined and stands higher than that of the other villages. A few junipers grow on the edge of the cliff, and on the mesa may be seen the *Cowania*, *Lycium*, and other plants familiar around the mesas of Tusayan. The ruin is oval in general outline, the north end approaches a half circle, the west side is straight, the south end is rounded, while the west wall runs in a northeasterly direction (Plate 41). The highest point is about 12 feet at the center of the mound, and another elevation at the north end of the mound is 7 feet above the base. These elevations mark the location of the highest rooms of the pueblo when it was in repair. From the shape of the ruins it appears that the village was pyramidal, the cross section at the highest point showing nine rooms. On the northwest a portion of the walls seems to have fallen *en masse* and lies buried in the ground giving the appearance of a pavement. At several points the walls may be traced. No detached houses or shrines were observed. The rocks below the edge of the mesa were examined for pictographs without success. If such existed formerly they were weathered out.

The cemetery lies to the northeast of the pueblo, where the soil composed of house refuse is thick. The burials were under sandstone slabs, as in the other cemeteries. It must be mentioned that occasional slabs were encountered in these ruins having circular holes several inches in diameter cut through them. A remarkable discovery was made in the cemetery of this ruin. In the midst of the burials

^a See Harper's New Monthly Magazine, March, 1902, p. 899.

the workmen came upon a mass of broken human bones, which proved to be the remains of three individuals. Some of the bones bore traces of fire, and there was no evidence that with them had been interred any organic material; moreover, marks of the implement with which the bones had been fractured were discernible. Undoubtedly here was evidence of cannibalism, but as the find is unique so far in this region it probably only indicates anthropophagy from necessity. Ceremonial cannibalism among the North American Indians was not unknown, however, as references in the early writers bear witness.

Near this ossuary was unearthed the skeleton of a priest, and with him a remarkable collection of the implements of his profession, consisting of polished translucent conoids and plates of worked chalcodony, cylinders of hæmatite, tablets of lignite, fossils, crystals, concretions, minerals, paints, bone plates and tubes, awls, a flint knife, a small paint pestle, the remains of a bow, etc. (Plate 43.)

This find is important, as it shows a class of articles connected with the cult of the Zuñi Indians.^a

Ruin No. 4 is located on a sand ridge between Nos. 1 and 3. It is rectangular in plan with a cross wall dividing it into two courts, and in the center of each court there is a depression. The south end of the ruin is stepped, giving this part a rounded outline. (Plate 44.) A corner room 10 feet square was cleared out and the walls exposed, showing masonry of inferior character. The west side of the mound is high, a feature noted in other ruins of this group. To the north and southeast are small house plans. Excavation in the cemetery to the east-northeast of the pueblo brought to light no features of difference from the other pueblos. A small number of pieces of pottery, worked stones, beads, etc., and some skeletons were taken out.

1. *Artifacts—Pottery.*—Red ware preponderates in the Canyon Butte ruins and gray rarely occurs, only seven pieces all told coming out, so that the group must be classified with those furnishing red ware exclusively. To this class belong the other ruins on the Petrified Forest Reserve, the neighboring ruins at Adamana, and the Milky Hollow, with the exception of Stone Axe and Metate sites.

For convenience of treatment the red ware may be divided into three kinds, namely, (1) rugose, (2) plain, polished, and (3) decorated. The rugose ware comprises coiled vessels, on the exterior of which the coiling has a decorative treatment;^b that is, (*a*) modeled as a smooth, salient ridge forming a spiral from the base to the rim of the vessel (Plate 45, fig 2); (*b*) the coiling worked in such a way as to divert the attention from the horizontal coiling lines, giving a pleasing rough effect like basketry (Plate 45, fig, 1), and in some cases the

^a See F. H. Cushing, Zuñi Fetiches, Second Annual Report of the Bureau of American Ethnology.

^b W. H. Holmes, Ornament in Ceramic Art, Fourth Annual Report of the Bureau of American Ethnology.

surface so treated has been polished without obliterating the crests and troughs of the waves (Plate 45, fig. 3); (c) the coils flattened down into a narrow ribbon, each coil imbricating its neighbor below, and (d) fine and regular coiling, with slight indentations on the coil ridge (Plate 45, fig. 4). The rugose ware is frequently decorated on the exterior over the rough surface with volutes and interlocking frets in white pigment. The specimen figured on Plate 46, fig. 3, is the finest example of its kind, a type hitherto undescribed. The exterior is red and the interior lustrous black like that of the Santa Clara ware. The rugose and plain bowls have all polished black interior, with the exception of one specimen (Plate 46, fig. 1), of which the interior is polished red bearing geometric decoration in black. Coarse black cooking pots, so common from ruins in the Pueblo region, are almost wanting in the Canyon Butte ruins.

2. *Plain ware*.—This ware, entirely in the form of bowls, offers little variety. The interior of the vessels is black and the exterior red, the surface showing the application of the polishing stone. These bowls are numerous and are from medium to small size. One small bowl is decorated on the exterior with three horizontal lines. A number of like bowls have a small pit in the center of the bottom, and it is surmised that these holes were to socket the lower end of a spindle. Such bowls are used in Mexico at present for this purpose.^a

3. *Decorated*.—A striking series of bright red bowls was secured in these ruins. These bowls are very large, are decorated on the exterior rim with frets in white (see Plates 46 and 47) and on the interior with geometric patterns, with which are incorporated conventional symbols. The stepped rain cloud forms the burden of the designs, involving rain, hail, birds, stars, etc., and perhaps corn, the two latter occupying panels surrounded by the geometric designs. One bowl shows an interesting pattern, in which the artist seems to have broken away from the traditions and produced a design of exceptional character (Plate 47, fig. 2). Two unique and beautiful bowls from a cist burial in ruin 1 merit especial attention (Plates 48 and 49). The exterior is yellow, on which an ingenious meander pattern in red is traced; the interior is of a deep, rich red, having a repeating fret pattern inclosed with bands of narrow horizontal lines, cross-hatched at intervals, painted in black on the surface; the bottom as in the other bowls left plain. The smaller bowl has the conventional symbol of four birds on the angles of a square.

A few pieces of red ware with white slipped interior, on which the design is painted in black occur here (Plate 61, fig. 2). Some have white rim decoration and in others the rim is plain. These pieces are of the Gila type described from Stone Axe ruin, and are perhaps imitations of the Gila ware.

^a J. N. Rose, Contributions from the U. S. National Herbarium, V, 1899, p. 251.

The paste of the finer red ware is of selected clay firing to a brownish yellow color. This was covered with a thick slip of red; the natural color of the paste is seen on the exterior of the bowls figured in Plate 48. The paste of the rugose vessels and plain red bowls is coarse, firing to dark gray on fractured edges. Most of the bowls are slipped with red, as not many clays give a good body color. The paste shows no admixture of pulverized fragments of pottery as does that of Zuñi, nothing more appearing than small pebbles, etc., which were impurities in the clay.

4. *Gray ware*.—From a cist grave in ruin 1 is a large deep gray bowl with striking ornamentation on the interior (Plate 50, fig. 2). The ornamentation and deep form of this bowl are unusual, the hatching of the design is like Zuñi. There is no exterior decoration. The paste is granular with small quartz pebbles. The vessel has been slipped with kaolin, and this process has been carried out on the other vessels for the reason that a better finish and whiter ware may be secured by clay lœvigated of coarse particles in water, forming slip or wash. Another gray bowl of thin ware with paste similar to the one just described is an excellent example of the highest skill of the potter (Plate 50, fig. 1). The pattern is a fret formed of small trapezoids produced by crossing diagonally accurately drawn lines, giving the effect of mosaic. On the field in the bottom of the bowl is painted with great skill a frog. The frog is a symbol of water and its symbolic use is widely diffused in the Pueblo region, carved in shell, formed in clay, worked in turquoise mosaic or painted on pottery. The treatment of the frog on this bowl is similar to that on the ware of the Navajo Springs region, of which an example was collected at Kintiel, an ancient Zuñi ruin 32 miles north of Navaho Springs, in 1896, by Dr. J. Walter Fewkes and the writer.

Mention should be made of a bowl with handle, a large dipper with rattle handle having a swastika on the interior of the bowl surrounded with a wedge design and a small oblong vessel with square orifice, at the four angles of which holes are drilled for the cords, terminating in feathers, which are tied to certain ceremonial vessels of the Zuñi and Hopi.^a

The presence in modern pueblos of articles of pottery, basketry, etc., a long distance from their place of origin is often noted and is due to the primitive commerce that has been carried on from time immemorial among the pueblo tribes. Necessarily from the perishable nature of many of the articles of trade, excavations in the ruins do not often yield instances of interchange. An interesting example was, however, secured in the Canyon Butte ruins in shape of a handled vase of gray ware with white decoration in brown on the body and

^aJ. Walter Fewkes, *Journal of American Archæology and Ethnology*, IV, p. 43, Boston, 1894.

bird tracks around the neck (Plate 51, fig. 1). On bringing the vase to Washington and comparing it with a specimen in the National Museum from St. Johns (Plate 51, fig. 2), the pieces are found to be similar in every respect, so that it could be affirmed that the same potter made them and that subsequently they are separated 60 miles. A modern vessel from Zuñi (Plate 51, fig. 3), shows relationship to the vases described.

The skeletons in the cemeteries of the Canyon Butte ruins were found to be in a poor state of preservation, so that only a few crania and skeletons could be secured. From a cursory examination of the bones it would seem that the people differed little, if any, from the brachycephalic, short-statured inhabitants of the Pueblo region. The material will be studied by an expert and the results presented in a monograph.

About $2\frac{1}{2}$ miles north of the Canyon Butte group, near a high point on the rim of the Puerco, was found a stone box set in the ground filled with a cement of puddled earth, mixed with charcoal and ashes, enveloping the bones of young turkeys. This seems to be a shrine, and is the only one of the kind known to the writer, and may afford a clue to the purpose of some of the similar isolated boxes which are of frequent occurrence in the pueblo region. These, however, may be eagle shrines near the nesting places of the birds of prey, so important in Pueblo cults, which are visited at present by the Hopi, the clans laying claim to the eagles of the localities where they settled during their migrations.^a A shrine of this character was discovered at Biddahoochee by the writer in 1901. The offerings were water in a ceremonial vase, food, and prayer sticks placed under a shelving rock near a lava-capped butte. The eagles of this locality are claimed by the Lizard clan. While the turkey is a venerated bird, it does not have the high rank accorded to the eagle. The obvious arrangement of the shrine on the Puerco rim may have had to do with a desire or prayer for the increase of turkeys.

The people of this group had the dog, but judging by the bones picked from the excavations their game animals were the deer, turkey, and rabbit.

The ancient pipe of the Pueblos is tubular,^b worked of pottery or stone, the favorite material being vesicular lava. Pipes of lava are abundant in the triangle between the Puerco and Little Colorado rivers, just within the boundary of the range of clans of Zuñi culture, and from their abundance this seems to be the type region. Tubular pottery pipes, and occasionally one of stone, occur sparingly in the

^a See the interesting paper by J. Walter Fewkes, entitled Property Right in Eagles among the Hopi, *American Anthropologist* (N. S.), II, Oct.-Dec., 1900, p. 690.

^b See Pipes and Smoking Customs of the American Aborigines, J. D. McGuire, *Annual Report, U. S. National Museum*, 1897, p. 378.

ruins of Tusayan. Larger tubes of stone of similar forms to the pipes are supposed to have been used for blowing clouds of smoke on sacred meal and during the ceremonies to the cardinal points. This must have been attended with some difficulty in practice. The smaller pipes are undoubtedly designed for smoking. In many of those from the Petrified Forest region a definite bowl has been worked out (Plate 52, fig. 8); a number show an hour-glass section, caused by boring from either end, and in some the tube is smoothly bored. Forms of these pipes are shown in Plate 52, figs. 7, 8, and 9; figs. 1 and 2 are from Scorse Ranch. An interesting specimen from the Milky Wash ruin shows the application of a bone stem to a small lava pipe bowl (Plate 52, fig. 3). The stem fits snugly against a septum of baked clay inside the bore, and forms the bottom of the bowl, which has been cut out as in fig. 8. Attention is particularly called to this feature, as the use of a stem with the ancient stone tubular pipe has not before been noted.

Another specimen of unique form is from the Metate ruin (Plate 52, fig. 6). The material is of the fine-grained reddish sandstone of the region. The lower end of the pipe has been worked out as a stem or for the securing of a wooden stem, as in the pipes of the Hupa Indians of California.

The Tusayan pottery pipes, from their material, offer much more latitude in construction and ornament than those of lava, the latter sometimes showing a pit-shape depression or a row of such pits as decoration. In general these pipes are fusiform, with bowl worked out in the end and a central bore opened through the tube with a slender stick while the clay is green. Frequently these pipes are decorated with dark-brown color. Occasionally the tube is bent slightly. The specimen (Plate 52, fig. 5) is of pottery, extremely well made, and polished, the color dark brown. It was found at Awatobi in a vase with a number of similar specimens, and was presented by Mr. Julius Wetzler, of Holbrook, Arizona. The squared stem and globular bowl mark a greater differentiation than is observed in the more ancient tubular forms. The pipes of clay and stone used by the Hopi in their ceremonies at present show a variety of forms from the simple tube to shapes approximating the European pipe. Many of these pipes are curved or bent to as great an angle as would be consistent with punching the orifice through from both ends, and often they are modeled in the shape of animals. No pipes showing this degree of elaboration are found in the ancient pueblo ruins.

ADAMANA.

Near Adamana Station, on the Santa Fé Railroad, is a large stone ruin 150 feet square, two rooms deep, surrounding an open court having a single gateway to the north. The scanty débris and the almost

entire absence of pottery fragments indicate a short occupation of this pueblo. On the rocks under the mesa near by, however, is one of the most remarkable galleries of petroglyphs that it has been my good fortune to see. The designs are mostly of animals, a bird with long bill occurring frequently. No familiar symbols were noted.

METATE.

Across the wash from the Petrified Bridge is a ruin covering the apex and extending about halfway down the flanks of a conical hill. The houses were rectangular and were built of lava blocks. The hill bristles with oval inclosures and lines formed by setting on edge large slabs of stone, principally those worked out as metates, and from the number of these objects the site was given its name. The ruin is badly washed and blown out; and it was not thought profitable to work it, but a careful examination was made, a little excavation prosecuted, and a number of specimens gathered from the surface *débris*. The pottery is of coarse texture and undecorated except by lines scratched in the paste or by indentation in the coil, the colors gray-brown and black. The former inhabitants were workers in stone, as is evidenced by the profusion of such relics in the great accumulations of *débris* and the numerous metates and stone battering hammers. Several axes, a digging stone of *chert*, and the half of a tubular pipe of curious form were picked up. The metate people were in touch with primitive commerce, as fragments of wristlets cut from seashell manifest.

It must be acknowledged that Metate ruin is an archaeological enigma in the light of present knowledge. It is possible, however, that a survey of the ruins in the Navaho Springs region, where pottery with scratched ornamentation occurs, would clear up the matter. On weathered sandstone rocks near Metate ruin faint petroglyphs may be traced.

Three small ruins on the bluff above Metate ruin belong, from the character of the pottery fragments, with the Canyon Butte ruins north of the forest.

WOODRUFF.

The pyramidal lava-covered mass called Woodruff or Canyon Butte, the Mesa Prieta of the Mexicans, a prominent landmark over a wide region in northeastern Arizona, has on its southern terrace a remarkable series of circular remains. These circular platforms are from 50 to 75 feet in diameter, bordered with lava blocks. The platforms are level and smooth and have no traces of constructions upon them. Seventy circles were counted beginning about halfway down the butte and stretching both as connected and disconnected terraces to the edge of the bluff above the Lee farm house. Near the northeast end of the

terrace, judging from débris there, appear to have been habitations, but no walls could be distinguished. Building stones consisting of blocks of basalt are abundant. It is likely that the stone for the long wall built by Mr. Lee to inclose his goat range may have been in part taken from ruins. Pottery fragments are very scarce and those found are of the coarsest description of red and yellow brown, the latter with paste containing small pebbles resembling that of cooking vessels from Tanner Springs, on Le Roux Wash (see Map, Plate 1). A few hammers of fossil wood were seen. It is said that the numerous visitors to the butte are responsible for the paucity of surface relics, which is no doubt true. The conclusions as to the pottery, however, were drawn from an undisturbed section at the foot of the butte in the house yard of Mr. Lee where several skeletons had been found.

On the summit of Canyon Butte are remains of stone houses, the point affording an extended and agreeable view, especially over the alfalfa fields of Woodruff. The small birds carved from dark-blue steatite, figured by Dr. Walter Fewkes,^a were found on Woodruff Butte.

Speaking in the light of a superficial examination of these ruins, it seems that they are to be classed with the garden plots so common around ruins in the Southwest, and of which the gardens at Zuñi and Walpi are familiar modern examples. It must be said, however, that the labor expended in grading and terracing on Woodruff Butte has been enormous for what at present seems a futile effort.^b

MILKY HOLLOW.

To the east of the Petrified Forest, about 9 miles, is a ruin located on the edge of Milky Hollow and extending in a narrow strip along the edge about three-quarters of a mile (Plate 53). The village is being swept down into the Bad Lands and much of it has disappeared, including the cemeteries. The houses were small and rudely built, stone being very scarce. Pottery fragments are scanty, the ware coarse and undecorated, red, gray, and black in color. Stone implements, however, exhibiting excellent workmanship, are abundant, such as metates, small, neatly-finished mortars of granite, limestone, and quartzite; stone cups, scrapers, drills, stone balls, and a hoe of petrified wood among the rest. Some shell ornaments were found and two small lava pipes with bone stems or mouthpieces (Plate 52, fig. 3). These pipes and mouthpieces were found in place on the west side of the ruin, the stems with the bowls, but not fitted in them. On adjusting the stem it was found to fit accurately against a ridge of burnt

^a Report, Smithsonian Institution, 1897, p. 605, pl. III.

^b There is a tradition that when the Mormon colonists of Woodruff were putting in their first dam the remains of a former dam in the Little Colorado came to light.

clay around the interior of the bowl. The pipe thus resembles in form the tubular pipes of the Hupa Indians of California.^a

Strangely enough, the ancients of Milky Hollow possessed stoves, a number of which were seen near the house groups. They consist of two slabs of stone set up parallel in the ground about 8 inches apart, and across one end at right angles was a movable slab having a round hole 3 to 4 inches in diameter cut through it. No cover stone was seen in place, but such slab usually lay close by. The slabs were reddened and smoked by the action of the fire. It is evident that the perforated slab was an arrangement for regulating the draft, an essential matter in open-air fires in this windy region, where on many days the camper has to dig a pit for his fire and throw up a mound of earth to the leeward in order to reduce the difficulties of cooking. The position of the stoves near the houses and their number indicate that they were for domestic purposes, either for cooking wafer bread, in the manner of the Hopi and Zuñi, or as a primitive andiron on which the pots could be conveniently set. Mrs. M. C. Stevenson informs me that the Zuñi have a similar device, which may be termed a fire altar.

It does not seem possible to classify the people of Milky Wash ruin from the data at hand. It may be affirmed, however, that they were a people of low state of culture, not related to the tribes occupying the known pueblos of this region, unless it be the Metate ruin.

STONE AXE.

This ruin, so named from the number of actinolite axes found on the surface by cowboys, lies $4\frac{1}{2}$ miles east of the Central Petrified Forest, on the north slope, near the divide between the Puerco and Little Colorado rivers, 30 miles east of Holbrook (see Map, Plate 38). The road from Adamana to Cart's Tank and the Long H Ranch passes near the ruin, and the Black Knoll, a landscape feature of the region, stands a few miles from it to the north. The Milky Hollow ruin lies $4\frac{1}{2}$ miles to the east, and the Metate ruin, opposite the Petrified Bridge, an equal distance to the west. The country is high, rolling prairie, draining into washes leading to the Puerco. The elevations are sand ridges or low hills showing outcrop of Triassic fossils. There are no springs, permanent water being found only below the bed of the wash, near the Petrified Bridge. After a rain storm, water stands for a time in natural mud-lined reservoirs in the draws. The region of the Stone Axe is treeless, and there is little animal life. As there is no building stone, the ruin presents only mounds of ill-defined outline on the point of a ridge between two small washes. A survey of the ground shows four rectangular mounds facing

^a O. T. Mason, The Ray Collection, Report, Smithsonian Institution, 1886, pl. xvi.

north, grouped around three sides of a plaza (Plate 54). Some distance to the south on the sand ridge are evidences of detached houses. About $2\frac{1}{2}$ miles to the southwest, on the neighboring ridge, are three small village sites where artifacts are different from those in Stone Axe ruin. The winds have full sweep and power. The loose character of the soil renders it easily displaced by the infrequent and often torrential rains, and by these agencies many of the ancient pueblos of this locality have been almost swept away. In some cases the obliteration has been thorough. Near Stone Axe large tanks with hardpan bottoms, seemingly excavated by human agency, were found to be a result of wind action. It appears that wind erosion is equal to the erosion by water in this region. Much of the surface of the former mound of Stone Axe has been swept away, but enough remains to render it probable that the houses were formed by sinking a square hole in the ground to the depth of 3 to 4 feet and throwing the earth up around it to make low walls. The roof covering was probably a thatch of brush and grass. The roof in this region was required more for protection from the sun's rays than from the storm. The detached houses to the south of the pueblo show no ground plans. Their location was indicated by the presence of large coiled jars, ornamented vases, and pottery fragments exposed by the wind. These large jars had evidently been buried in the ground for storage of water as Castañeda relates of the Hopi.^a

Great quantities of potshards are scattered over the ruin and a number of stone hammers, metates, and hand stones lay about. Bits of copper paint stone, obsidian, flint, shell, and an occasional arrow point rewarded the search. The pottery fragments on the surface show ware of better quality and decoration, on the whole, than that excavated in the cemeteries, but not different in character.

The cemeteries, three in number, are on the glacis directly in front of the main division of the ruin (see plan, Plate 54). A few sporadic burials exist on the east side. The burials were at length, with heads usually to the west, at a depth from 2 to 5 feet, in soil mainly of house refuse, and the skeletons were in rather good condition. From 150 to 200 burials, it is estimated, were made around this pueblo.

It was customary here to place food bowls, vases, cups, and other articles of pottery in the grave near the head. Many of the graves contained no mortuary objects whatever, which is unusual. Shell beads, ornaments of shell, awls, and tubes of bone, arrow-smoothing stones, scrapers and knives of obsidian and chert, red, green, yellow, and black paint were commonly found, also fragments of mats, coiled basketry, and pahos. Clinging to one skull was a fragment of a mosaic earring, formed of oblong, rectangular plates of turquoise set

^a Fourteenth Annual Report of the Bureau of American Ethnology, p. 490.

on a tablet of wood; beyond this, very little turquoise came to light. The collection secured here was small, though varied. Of stone, there are axes of actinolite (Plate 55, fig. 8), a material prized by the ancient Hopi and Zuñi; spherical battering hammers of fossil wood; rubbing stones like those from California (Plate 55, fig. 10); arrow smoothers of lava (Plate 55, fig. 9) and limestone (Plate 55, fig. 7); cylinders, disks, and spheres of sandstone (Plate 55, figs. 4, 5, and 6), probably used in games; drills, arrowheads, and knives of chalcedony and obsidian (Plate 55, figs. 1, 2, and 3); and tubular pipes of lava. Of shell there are gorgets of different shape cut from large shells or formed by merely polishing and perforating a sea shell (Plate 56, figs. 1, 2, 3, 5, and 6); a few olivella beads and small beads of cylindrical form. Of bone, there are awls, knives, tubes, and notably a whistle and a notched scapula, the former of eagle wing bone (Plate 56, fig. 2) with a hole cut through the wall near the middle where a small lump of pitch was inserted into the canal to produce a sound as in the whistles of the Kiowas and other plains' tribes, and found also among the present Hopi. The notched scapula (Plate 56, fig. 11) is from the deer. The instrument is still in use for ceremonial music among various existing pueblos and tribes of northern Mexico, and is played by laying it across a gourd or jar and scraping the notches with a stick.^a

Some obsidian was found at Stone Axe, but no arrowheads or implements of this material were seen. Vesicular lava was worked into spheres, cylinders, and pipes. Fossil wood and limestone were employed for hammers, scrapers, axes, arrowheads, etc. In this connection should be noticed a fragment of a limestone axe having scores on the side, which brings to mind similar specimens from Biddahoochee and Cheylon. Metates and hand stones were numerous and well worked out, the material being red and gray freestone.

Green, red, yellow, and dark brown paint stones, the latter of specular iron ore used by the Hopi in ceremonies, were collected.

Remains of textiles were seen. Fragments of pahos were observed during the excavations, but they were not numerous.

The pottery of this ruin proves very interesting and gives the most important indication that the former inhabitants of Stone Axe were related to the Hopi. This fact is an important contribution to our knowledge of the migration of this people, as it was not anticipated that traces of them would be found in this region. This ruin is about 70 miles east of Homolobi, a group of Hopi ruins near Winslow, explored by Dr. Fewkes and the writer in 1896, and 50 miles southeast of the new group of Hopi ruins near Biddahoochee, which were discovered by the writer during the autumn of 1901. (See p. 326.)

The pottery presents greater variety than that of the ancient pueblos in the vicinity of the Hopi towns of Tusayan, which are characterized

^a Third Annual Report of the Bureau of American Ethnology, p. 394.

by yellow ware of unmixed paste. About half of the ware is of the type mentioned, varying in shades from cream to orange, the decoration in geometric and geometric-symbolical or symbolism verging on geometricism, the color brown, the forms bowls, vases, and dippers, the bowls having exterior rim decorations. (Plates 58 and 62.)

Among the minor articles of pottery collected are spiral relief ornaments which had been used in decoration (Plate 56, figs. 7 and 9); disks ground from pottery, often perforated as in spindle whorls (Plate 56, fig. 8); a rectangular fragment, on the edge of which teeth like a comb have been cut (Plate 56, fig. 11); a fragment of a globular rattle, perforated, of yellow ware; a dipper handle with rude attempt to represent an animal; scrapers; oblong tablets ground from polychrome ware in shape like the stone ornaments, etc. From the small ruins $2\frac{1}{2}$ miles to the west are disks, canteen lugs, etc. It was observed here that cup-shaped depressions were made in large vessels to aid the grasp. This feature is found in many ruins along the White Mountains, almost always associated with gray ware.

The collection shows a number of bowls of red ware of mixed paste, slipped on the interior with white, upon which are painted subgeometric designs in black; very few of these specimens have rim decorations. With this class are several polychrome vases, one quite large (Plate 57), the body of mixed paste burning light red. On this ground white is applied, outlining the portions of the design that are intended to be red. On the white areas portions of the design are painted black. In some instances the red areas are intensified with a wash of deeper red. The ware just described is of Gila type. Similar bowls have been found in the ruins north of the Petrified Forest, at Four-mile, Chaves Pass, Cheylon, and Homolobi,^a being prevalent in the ruins along the White and Mogollon plateaux, where the Gila influence is strong, and occurring sporadically along the Little Colorado and Puerco and to the north of these streams, except at Stone Axe, where the proportion is about that of Four Mile. The presence at Stone Axe of light red ware, characteristically decorated with narrow white lines breaking the field into irregular wedges, must be noted; also thin bowls of gray paste slipped all over with white and having sparse decoration in dark green or brown enamel. These types appear at Cheylon, Homolobi, and Biddahoochee, and W. H. Holmes informs me that the white ware occurs at Jemez, on the Rio Grande. The ware also has a vivid polychrome decoration of green, red, and white at Stone Axe; only fragments, however, were secured. (For remarks on distribution of pottery, see p. 354.)

The accompanying plates give a good idea of the color, form, and symbolism of the pottery from this important ruin. It will be seen that there is the same remarkable variety here that also characterizes

^aJ. W. Fewkes, Report, Smithsonian Institution, 1896.

the Homolobi, Biddahoochee, and many of the groups south of the Little Colorado, in contrast with the uniformity of the Northern groups, where gray ware abounds. This feature goes to show that the clans coming from the South passed through regions inhabited by tribes of different culture or arts and in the course of the migration incorporated some of these arts with their own. This is readily accomplished by clan marriage, since most of the arts, notably pottery and basketry, are in the possession of the women and are therefore readily transferred from clan to clan, provided that conservatism does not fix and require artifacts of a particular class within the clan into which the woman may be received. Of course in an orderly procedure the woman does not go to live with her husband's clan, but the opposite; still at present it is known that there are exceptions to this rule. On the whole, the accessions by which arts are carried from one clan to another would be by families. Thus the pottery of Gila type, which is equal in amount here with that of the yellow or Tusayan type, might represent the artifacts of an element from the Upper Gila and the yellow that of the Asa clan, which migrated from the Rio Grande to Tusayan by way of Zuñi. While this is conjectural, the symbolism on the yellow ware resembles that of the Jettyto Valley ruins, and the yellow ware alone bears symbolism of this character.

Typical specimens of this class of pottery are shown in Plates 58 and 59, while brownish yellow, also of this class, is shown on Plate 60. The color of the decoration is dark brown, and only in the case of the bowl with symbolism (Plate 60, fig. 2) is red used in connection with the brown.

Several vases of an ancient Hopi form were collected. The specimen figured (Plate 58, fig. 2) has a decoration in red-brown around the body. A bowl of fine yellow (Plate 58, fig. 1) is rudely decorated, having irregular patches of pigment applied with no system on the interior; it has an exterior rim decoration of unknown meaning. The bowl (Plate 59, fig. 1) bears a geometric decoration involving a number of bird forms; in the center is the familiar symbol of two birds with interlocking beaks adapted to a square figure. Another bowl of fine texture (Plate 59, fig. 2) bears on the interior a symbolic design surrounded with the "life line." The bowl (Plate 60, fig. 1) is decorated with a conventional bird, and the second figure on this plate bears a symbolic design representing a supernatural being in the style of the Katchina figures of the Hopi.

The ware with wash of white and decoration in enamel (Plate 61, fig. 1) bears a decoration on the interior of three interlocking hook forms which seemingly represent tails of snakes. A set of two zigzag lines extend around the exterior rim of the bowl; the space between these lines is often filled in with red. The second figure on this plate is a good example of the Gila type with geometric decoration. On the

edge of the rim are rows of small white marks, usually eight in each group; there is no decoration on the exterior. The specimen was up-turned when placed in the grave, hence it is well preserved. Moreover, it was perfectly new and unused when buried.

A bowl (Plate 62, fig. 1) of yellow-brown ware shows a fine arrangement of a complicated geometric design in which there are numerous bird forms. These may be traced in the square in the center and in wedge-shaped sections above and below. The rim decoration is a simple step design in an oblong frame.

The second figure (Plate 62, fig. 2) is a perfect specimen of a rare decoration. The ware is light red, and the design on the exterior and interior is in narrow white lines. The home of this style of ware is not known to the writer, but examples resembling it were found at Biddahoochee.

A small vase of good red ware (Plate 64, fig. 1) with handle, in the form of an animal looking into the vessel, a common conceit among the ancient pueblo potters, has a geometric decoration in hatched and solid areas in dark brown color. With this specimen was a bowl of fine yellow ware. (See Plate 58, fig. 1.) These specimens are not related. The vase should belong to the St. John-Zuñi region, while the yellow piece belongs to the special area in Tusayan.

SMALL SITES NEAR STONE AXE.

Another vase of gray ware with conventional animal handle (Plate 64, fig. 2) was found together with an elegant canteen, now in the Gates collection, in a small ruin some miles to the west of Stone Axe. This vase is covered with a well-executed geometric decoration, the motive being terrace figures in the dual hatched and solid color. A red bowl from the same group (Plate 63, fig. 1) shows the same treatment. The specimen is quite similar to bowls found at Forestdale, Showlow, Scorse Ranch, and Canyon Butte. It has no exterior decoration in common with those mentioned; a bowl from the small ruins near Stone Axe, without interior decoration, has horizontal bands of white on the exterior. (Plate 63, fig. 2.) The white exterior decoration is also common to the ruins mentioned above.

It will be seen that Stone Axe ruin presents a number of features of great interest to the student and some problems which may be solved when we come to know more of the ruined pueblos of the Southwest, multitudes of which await the explorer.

The group of small ruins 3 miles southwest of Stone Axe furnished hard gray ware, with black geometric decoration, soft red ware, and coiled ware with patterns formed by punching the coil ridges. These data affiliate the ruins with the numerous small pueblos scattered along the northern side of the White Mountains, apparently belonging to

the Upper Salt River or Zuñi type. The forms in gray ware, with geometric decoration in black, are canteens with pierced lugs, handled vases with tubular necks, large flaring bowls, and a small trilobed cup. The red ware was found only in form of bowls of incurved or slightly curved wall form, the decoration in black sometimes outlined with white. Numerous pottery and stone disks were found on the surface, and some shell ornaments, a spindle whorl, arrow smoother, etc., were picked up. Fragments of large coiled vessels with ornamentation formed by indenting the coil ridges were common here. None of these ruins showed above ten rooms.

Abundant somatological material was secured from Stone Axe, consisting of crania, skeletons, and parts of skeletons, numbering 30 entries. The skulls are brachycephalic and show in adults occipital flattening. The skulls of children do not present this feature. It is expected that this material will be described by a competent specialist when comparison may be had with the material collected by Dr. Fewkes and myself in 1896 and 1897 and reported on by Dr. Hrdlicka. Bones of animals brought up during excavation were carefully collected, no mammals larger than deer and antelope being noted. A portion of the skull of a dog was found.

As mentioned, the affiliations by arts of the Stone Axe people seem to be with the clans migrating from the south to Tusayan, which form an important element in the Hopi complex. The stations to the south in this case have not been located as yet. The next stopping place to the north, I believe, was Biddahoochee, and the route followed was by Carrizo Creek, which enters the Puerco a few miles west of Adamana, up this wash into the Le Roux Valley, and across into the valley of the Cottonwood, 8 miles southeast of Biddahoochee. (See map, Plate 1.)

The large stone ruin at Adamana, 9 miles northwest of Stone Axe, does not seem to have been occupied by this clan (see p. 317); neither does the small ruin a short distance north of the Puerco, near Adamana. The distance to the Biddahoochee group is about 25 to 30 miles by the route indicated, not too great for a single move, longer migrations having been noted in the pueblo region.

HOPÍ BUTTES AND MESAS.

BIDDAHOOCHÉE—CHAKPAHU—KOKOPNYAMA—KAWAIOKUH—PERIODS OF TUSAYAN
WARE—AGE OF JETTYTO VALLEY RUINS.

BIDDAHOOCHÉE.

For a number of years pottery has been coming into Holbrook from the north, and for the best of reasons the persons collecting pottery for gain were indefinite as to locations until the spoils had been gathered. The specimens brought in were usually mixed as to quality and

color of wares, due to careless methods of collection. The presence of fine yellow pottery of Hopi type in these mixed lots of gray, red, etc., led the writer to attempt to disentangle the problem in May, 1901, but sand storms prevented more than a glance at a few ruins on Le Roux Wash. In September, after the close of work with the Museum-Gates expedition, the thread was taken up again. The services of Juan Baca, the most assiduous "pottery digger" of this region of the Southwest, were secured, and an extensive reconnoissance was carried out, resulting in the mapping of the ruins to 40 miles north of Holbrook. (Plates 30 and 65.) Plans of the more important ruins were made (Plate 66), photographs taken, some pottery and pottery fragments and a few crania collected.

The Cottonwood Wash ruins are scattered about in an area of perhaps 30 square miles, mostly along the north side of the stream east and west of the crossing of the Holbrook-Keams Canyon road, at 7 miles south of Biddahoochee. (See sketch map, Plate 65.) From this crossing the Cottonwood runs southwest, entering the Little Colorado near Winslow. The upper portion of the stream is indefinite on the maps, and it is only possible to say that the wash parallels Le Roux Wash and has important branches from the north among the Moki Buttes on the 6,000-foot contour.

The first ruin examined lies on the level plain, 4 or 5 miles northeast of the buttes between which the Holbrook road passes. The location is at the head of a small, narrow canyon running north to the Cottonwood. The ruin is fairly large and is divided into two sections by the canyon; the part to the west is rectangular, and the eastern section is roughly circular. A seep spring, now dry, exists in the canyon below the ruins. The labors of coyotes and other animals digging for water were evident here. The numerous potsbards are mostly of fine yellow ware; some fragments of thin red, with enamel decoration, and of white, with green enamel decoration, were seen.

Following down the canyon to the Cottonwood Wash and going west to the Navaho hogans, near where the Holbrook road crosses, a large ruin on the bluff was examined and sketched (Plate 66). The ruin consists of a quadrangle on the level at the top of the bluff and a prolongation conforming to a promontory bounded on the west by a deep ravine. From the number of human bones scattered about it is evident that the cemeteries had contained many burials. The pottery fragments are abundant and of fine quality like those of the ruins just described. On the same bluff, not far away, is a small ruin belonging to this group.

The Navahos in the valley have impounded the waters of the wash by means of a dam, thus securing enough water to last for several years. Several of the Indians told me that there is an ancient ruin on the summit of the large butte across the valley. Lack of time

rendered it impossible to verify this story. There is every reason to believe that a ruin crowns a low, block-shaped butte (Plate 67, fig. 1) some miles to the west of the ruins just described. At the base of this butte, near a Navaho corral, the cemetery has been excavated (Plate 67, fig. 2). The ware is yellow, red, and gray and not of the finer class.

Some few miles down the wash, on the southeast front of a large butte, are two ruins with a spring in a gulch between them. They also show ancient Hopi ware and were rifled several years ago.

The remaining member of this group is a small site containing six rooms, lying one-half mile south of the first butte on the Holbrook and Keams Canyon road.

As a result of the researches in this locality the writer was able to identify the specimens in the Scorse collection at Holbrook, procured by Juan Baca. In view of the interest attaching to the group of ancient Hopi pueblos examined for the first time, the purchase of these excellent museum specimens was recommended, and they were acquired by the Bureau of American Ethnology.

While the typical yellow ware characteristic of Tusayan makes up the bulk of the collection, there are several other kinds of ware that give the ruins additional interest as probably denoting the union of clans of differing culture. The yellow ware of Biddahoochee resembles that of Homolobi, collected by Dr. J. Walter Fewkes and the writer.^a It has fine, homogeneous paste, varying in shade from cream color to orange. One specimen (see Plate 72, fig. 2) is of bright lemon color. It is necessary to class the earth color and salmon color ware with the yellow. The decoration is in dark brown, red brown, and light brown. The designs are geometric, of great variety and boldness, as though not far removed from the original naturalistic concepts. Symbolism like that of the pottery found near Walpi is rare. Brief symbols are the arrow, feather, lightning, birds, corn, and the butterfly, a number of which will be noted in the plates of illustrations.

The forms of yellow ware are bowls, cups, vases, and dippers, the latter often with animal handles.

Four typical yellow bowls are shown on Plates 68 and 69. Plate 68, fig. 1, is of fine, clear, yellow paste, and the design incorporates several bird forms. The second figure is also of fine yellow paste; the design in red brown, apparently incorporates snakes or lightning.

Another bowl (Plate 69, fig. 1) of ocher yellow has a geometric design in hachure and solid color, which is unusual in this locality. The remaining bowl (Plate 69, fig. 2), which is also of ocher yellow, has a geometric design in two sections. In the open area between the sections are two flying arrows.

^a In a forthcoming Report of the Bureau of American Ethnology.

A small dipper with animal handle (Plate 70, fig. 1) has a design on the interior representing corn. Another dipper with animal handle is shown (Plate 70, fig. 2). A cup of fine yellow ware (Plate 70, fig. 3) has an unskillfully drawn decoration on the body. The design seems to be the four-bird symbol arranged in a band. The small bowl with handle (Plate 70, fig. 4) is a fine specimen, exhibiting a geometric design margined with white. It has also marks in sets of three on the rim, a feature often seen on vessels from the southern side of the basin of the Little Colorado and in ruins in other localities yielding gray or red ware.

Five interesting vases are shown on Plates 71, 72, and 73. Plate 69, fig. 1, is decorated with conventional birds, and the second figure bears the four-bird symbol. Vase (Plate 72, fig. 1), has a decoration of unknown meaning; the design is margined with white. The remaining vase (Plate 72, fig. 2) is a beautiful specimen of lemon-yellow color, with elegant geometric decoration. In shape this vase is like the best specimens from Sikyatki and Jettyto Valley. The vases from these ruins are generally of inferior shape to those from the Hopi ruins to the north. A large vase (Plate 73), of rich orange color, from the Cottonwood ruins, bears a geometric design in which hachure is employed.

Three unique bowls of red ware belong to this collection. The paste is dark on fractured edges, but where it is exposed to the fire it burns to a pure brick color. The largest bowl (Plate 74) is decorated on the interior, consisting of three segments outlining a trefoil area in the bottom of the bowl. The exterior walls of the bowl are decorated with frets of narrow white lines, as on the specimen from Stone Axe. (See Plate 62, fig. 2.) The interior decoration is in dark green enamel. Another bowl (Plate 75, fig. 2) has the interior covered with white kaolin slip, and on this ground were painted interlocking frets in bright green enamel. The exterior is red, with a maze fret design in narrow white lines. In one section the space between the lines is filled with green enamel. The bowl is a brilliant specimen of polychrome ware. The third bowl (Plate 75, fig. 1) is one of the most artistic specimens of ancient American ceramics known to the writer. It shows remarkable taste in its design and execution. The bowl is bright red in color; the special feature of its decoration is a zone of white around the walls of the interior. On this band is painted a key design of serrated hooked figures (birds) in green enamel. The center of the bottom is a field of red. The exterior of the bowl also has lozenge designs in narrow lines of white. The field of the lozenge is crossed by vertical lines, in turn crossed by short bars.

White ware.—Another remarkable group of ware was found in the Cottonwood ruins. This consists of two bowls and two vases of fine

white paste, well finished and of good form. (Plates 76 and 77.) The decoration is in enamel leaf green and dark green in color, except in the small vase, which is decorated in red. The enamel is like that on the polychrome ware. The white ware resembles that from Stone Axe in the Petrified Forest Reserve, described on page 323, which also shows a similar enamel paint. The green color is due to the presence of iron, and it is evident that the pigment was applied in a pasty condition from the uneven lines. The enamel, on fusing, also spread and ran into lumps. In some cases the enamel has affected the ground, producing a delicate pink margin around the design. I am not aware of the process employed in producing this enamel. It has been suggested that the ordinary iron pigment may have been mixed with pinyon gum.

The inner wall of bowl No. 212,329 (Plate 76, fig. 1) is decorated with a zone of diagonal frets and parallel lines, inclosed in bands of horizontal lines, divided at intervals by square areas with a dot in the center. The exterior has two double rain-cloud designs and another figure of unknown meaning. The second bowl (Plate 76, fig. 2) has a zone of frets on the interior and on the exterior four equidistant groups of stepped lines in pairs. The texture of this bowl is fine. The unique vase (Plate 77, fig. 2) is also of fine texture. The design consists of three figures, representing four birds on the corners of a quadrangle, inclosing two diamond-shape figures. Around the neck are alternate pairs of vertical and horizontal short lines. The vase has had a short handle, probably an animal head, projecting from the neck. The color of the decoration is a clear, leaf-green enamel, with glazed surface. The remaining vase (Plate 77, fig. 1) has a simple design around the body and a band below the neck in soft red color.

Gray ware.—Some of the specimens of gray ware resemble those of Scorse Ranch. In general, it may be said that the gray ware found in the ancient Hopi ruins is of finer quality and more accurate finish than that of the San Juan. The design and forms also render most of the ancient Hopi gray ware unmistakable.

The casual observer will note that the food bowls, for instance, are rarely so distorted as those found on sites furnishing the gray and the red pottery alone. A dipper bowl (Plate 78, fig. 1) bears an effective design in lustrous black. The vase (Plate 78, fig. 2) is remarkable both for its elegant form and the handle on which is represented a snake with head bent down toward the interior of the vase. This specimen has been overfired, darkening the ground and design, and rendering the paste hard as stoneware. It will be noted that the design is in hachure and solid black. (See page 354.)

A number of small forms of gray ware shown are excellent examples of this type of pottery. The bird-form vase (Plate 79, fig. 6) combines

a conventional representation of the bird topography, with a realistic treatment in the modeling of the tail. The small cup, shaped like a teacup (Plate 79, fig. 3), is of thin ware, and the decoration blends with the background in a pleasing manner. Another cup (Plate 79, fig. 5) is of a form found over a wide range of territory in northern New Mexico and Arizona. Two almost identical specimens are found by Dr. Fewkes and the writer at Homolobi. The ware is fine, and the decoration blends softly into the ground. One of the finest pieces is the four-lobed vase (Plate 79, fig. 4), with a pleasing design in deep polished black. A small vase (Plate 79, fig. 2) is also an artistic specimen, and the dipper (Plate 79, fig. 1) is of the customary form.

Some of the finest examples of coiled ware also come from the Bidahoochee region. Plate 80, fig. 3, shows a vase of good workmanship and a small vase of diversified pattern (Plate 80, figs. 1 and 2). This is the best piece of the kind that has come to my notice. The design is produced by alternate plain and pinched coils beginning at the center of the bottom and extending to the lip, and shows what may be done in the artistic treatment of the coiling.

A number of stone implements are in this collection. These consist of grooved stone hammers, the material, quartzite (Plate 81, fig. 4), ground axes of basalt (Plate 81, figs. 1 and 2), and chert knives, drills, and arrowheads.

Ax No. 212,407 (Plate 81, fig. 1) resembles the double-bitted axes from the Jettyto Valley ruins. Ax No. 212,413 (Plate 81, fig. 4) is of fine white crystalline limestone or marble. The specimen is carefully finished and polished. Four scores are cut on the surface near the groove and seven small pits are sunken on the ridge bounding the planes of the cutting end. There is every evidence that the unique specimen was ceremonial in character. The reader is referred to a double-bitted ax of white stone found by Dr. Fewkes and the writer at Cheylon, which also has four scores on the side.^a A bird carved from white stone is also a fine example of stone carving.

• Shell objects were quite scarce in the Cottonwood ruins, only a fragment of a pectunculus shell armlet being encountered. Objects of stone and pottery, apparently spindle whorls, are in the collection. A stone disk has pits on either side, showing that boring was in process.

It is gratifying to be able to contribute one of the links in the chain of Hopi migrations from the Red land of the south and to add to one of the best pieces of archaeological work ever done in the Southwest. Reference is here made to the explorations of Dr. J. Walter Fewkes in the years 1896 and 1897, when he excavated the sites of the ancient Raincloud and Lizard clans at Chaves Pass, in the Mogollon Moun-

^a Report, Smithsonian Institution, 1896, p. 537, pl. XLVII.

tains, at Homolobi, on the Little Colorado River, near Winslow, Arizona, 2 degrees south of the present villages of the Hopi. It was the good fortune of the writer to be present during these epoch-marking investigations.

In an important paper^a by Dr. Fewkes a new clew to the migrations of the Hopi clans, based on the ownership of eagle's nests situated near the ancient seats of the clans, has been presented. The researches of Dr. Fewkes show that the Lizard clan, who migrated with the Raincloud clan, claim the eagle nests at Biddahoochee. It has been conclusively shown that the Raincloud clan settled for a time at Homolobi and that the Lizard clan located near them. From the character of the artifacts, especially from the polychrome ware with green decoration like that on Plate 75, the large ruin at the mouth of Cheylon Creek, 12 miles east from the Homolobi group, was the pueblo of the Lizard clan, which, with the Raincloud clan, followed the natural line of migration northeast along Cottonwood wash to Biddahoochee. Migration follows the water in this semiarid region and the great Cottonwood wash, which with greater precipitation would be a large river, offered abundant facilities for halting and putting in a crop of corn. Perhaps further investigations along the Cottonwood between Winslow and Biddahoochee will reveal halting places of the clans. To the Biddahoochee focus it is also believed that the clan from Stone Axe, east of the Petrified Forest, was drawn, and the proof also rests in the main on the ware mentioned. (Compare Plate 61 with Plate 76.)

East and west along the Moki buttes are sites yielding gray ware, which was probably the kind of pottery made by the northern clans entering into the Hopi complex, the art having been submerged and lost under that brought from the south and east.

The upper portion of the Jettyto Valley lies a few miles southeast of the first Hopi mesa. Its trend is southwest, paralleling Keams Canyon, and its waters find their way into the Little Colorado near the Cascade.

The valley is quite deep and wide, as travelers from Holbrook to Keams Canyon will testify from experiences in crossing it and climbing the Keam mesa. The north side of the valley here is walled by a high, abrupt sandstone mesa; the south side presents gentler contours, except to the east, where the head branches run in canyons. Navahos off the reservation have undisputed possession of the valley and their hogans and corn fields are frequent along the wash. A number of very large ruins are situated on promontories of the Keam mesa overlooking the valley. They begin at the Awatobi mesa, southeast of Walpi, and extend to "Mormon John's" spring, $2\frac{1}{2}$ miles east

^a Property Right in Eagles among the Hopi, *American Anthropologist* (N. S.), II, Oct.-Dec., 1900. Also Nineteenth Annual Report of the Bureau of Ethnology, Pt. 2.

of Keams Canyon School (Plate 82). Beginning on the west, the Hopi name the ruins Awatobi (Great and Little), Kawaiokuh, Chakpahu, Nesheptanga, and Kokopnyama, and on the south side of the valley, opposite the latter, Lululongturqui. Several smaller ruins are interspersed among the larger ruins, principally on the mesa top some distance from the edge; a few lie on the southern side of the valley. The cultivable tracts along the wash are strewn with potsherds.

Previous to 1901 the only Jettyto ruin scientifically explored was Awatobi, excavated by Dr. Fewkes,^a and subsequently by Dr. Frank Russell, of Harvard University. Plans of the larger ruins on the northwest side of Jettyto Valley were made by Victor Mindeleff.^b His "Mishiptonga" is Kawaiokuh; "Bat House" is Chakpahu; "Horn House" is Kokopnyama wrongly located; "a small ruin between Horn House and Bat House" is Nesheptanga. The ruin south of Kokopnyama, called Lululongturqui, is not described. It may be said that the examination of most of these ruins is attended with hardships because of the lack of water. Awatobi still has fine springs, and this fact, coupled with its accessibility, would sooner or later have led to its excavation. Water can be had within 1½ miles from Kokopnyama, also. The lack of water, however, has not prevented the Navaho tearing the Jettyto ruins to pieces in search of pottery for the trader.

The first Jettyto ruin worked by the Museum-Gates expedition was Kokopnyama, a Hopi name meaning "firewood people."^c The Navaho name is Delcalsacat, "wild gourd," and the name given it by white people is "Cottonwood ruin," from the trees, growing in one spot near by. It is located on a low, easily accessible mesa near Maupin's store, at Mormon John's spring, 2½ miles east of Keams Canyon School, and so far as known is the easternmost of the Jettyto Valley ruins and one of the largest.^d

The ruin is commandingly located on the mesa top, affording an extensive view over the valley below and over the country toward Keams Canyon (Plate 83). In the distance the Hopi Buttes fret the horizon with their remarkable outlines. Juniper and pinyon trees and an occasional oak clothe the top and flanks of the mesa. Large junipers grow near the ruins, but no trees occupy the zone of habitation. The location of the ancient spring is marked by four cottonwood trees growing close against the mesa; much digging near these trees has been done by Navaho in a futile search for water. Toward the valley the zone of pottery fragments extends for more than a mile, and

^aSeventeenth Annual Report of the Bureau of American Ethnology; Report, Smithsonian Institution, 1895; American Anthropologist, Oct., 1893.

^bEighth Annual Report of the Bureau of Ethnology.

^cThis name refers to the clans which lived here and is probably not the ancient designation of the village.

^dFor Mindeleff's plan see Eighth Annual Report of the Bureau of Ethnology, pl. VII, and brief description, p. 50.

beneath the village, heaped up against the mesa, is a great talus of house refuse. To the east of the site are sand dunes from 10 to 30 feet high, among which fine specimens of juniper flourish. Vegetation is scanty on the mesa, *Bigelovia graveolens* protecting *Tradescantia scopulorum* and other small herbs from browsing animals. On the talus below the mesa the customary Hopi berry bushes, *Lycium pallidum* and *Ribes cereum*, thrive.

An examination of Mindeleff's plan will show the lack of order in the accretion of house groups going to make up this pueblo, due in great part to the configuration of the margin of the mesa. The rear wall is the only uniform feature; the intermediate area seems to have been built over in a haphazard manner.

Portions of the pueblo were formerly at least four stories in height above the spring and along that section. Below the mesa many houses were built among the rocks, where excavation exposed walls running irregularly on account of the nature of the ground. Places of burial were found in these houses and under the rocks and in crevices, as is now customary in the latter case at the Hopi pueblos.

No walls remain standing on the ruin, and there are no traces of house beams.^a Excavation in the rooms showed walls rather poorly built of coarse soft sandstone laid in mud. Many of the rooms were plastered.

A group of lower rooms 7 feet square on the edge of the mesa above the spring and having the mesa as a floor were excavated. The walls were chinked with small stones; the fire hole was on the floor at the southwest. Small, low doors or openings between the rooms were noticed. On the floor lay lumps of clay, paint, flat mealing stones, small mortars, etc. The pottery in these rooms was altogether gray and red, a fact to be noticed later. No subterranean kiva could be found here or in any of the Jettyto ruins examined. Such kivas existed at Awatobi, however.

Scattered over the surface are vast numbers of potshards, almost invariably of yellow ware, many pieces showing interesting symbolism. At one spot near the edge of the mesa pottery was burned, leaving heaps of cinders and ashes. Lignite was used as fuel, the débris filling the houses and falling below the mesa, being largely composed of coal ashes derived from burning "bony" lignite. At the foot of the mesa south of the wash is a vein of pure coal 7 feet thick, and at this point is abundant evidence of pottery burning. Some fragments of vessels picked up had clinkers fused to the surface, and specimens of pottery burned to the hardness of stoneware occurred in the débris.

On a bench of the mesa a fire box was seen near a series of "gardens"

^a A number of beams from Awatobi are incorporated in the houses of Hano and Walpi. Some of these may be seen in Nampeo's house at Hano. They were secured by her husband, Lesu.

demarked with parallel lines of large stones. A small cist (Plate 84) was discovered in the cliff and photographed by Mr. Gates. This had been broken into, and there is now no means of ascertaining its purpose. The cist may have been made as a receptacle for cult objects. A single pictograph rewarded the search. This was on the face of an immense block of sandstone fallen from the rampart of the mesa. The pictograph, which apparently represents a mask, is obscured by weathering, and its preservation seems to be owing to a covering of lichen. The cliffs were searched for shrines without results.

Some time was spent in the endeavor to locate the cemetery. The sand dunes 200 yards back of the pueblo seemed favorable from the number of potshards there, but nothing was found, and it was thought that this cemetery had been destroyed long ago by the moving sand. It appears that several parties of prospectors for pottery met with disappointment at this ruin. The main talus of village refuse had been untouched, and excavation here yielded a fair collection, which has the distinction of being all that remains to tell of the ancient inhabitants of the pueblo of the firewood people.

The soil of the talus has been greatly solidified by pressure, the burials often showing as a mere narrow band of organic materials. Excavation was carried on by running a trench across the talus and carefully paring off the face, which was from 5 to 8 feet high. (Plate 85.) The bodies were placed with the head to the northwest, the face toward the mesa, the legs being flexed. Mats were wrapped around the body, and the remains of coiled and wicker baskets, cord of hair, cloth of animal fiber, and feather textile show a considerable variety in this class. Near the head were usually found lumps of gray and yellow clay, red and yellow paint, and a flake knife of flint; the pottery also was placed around the head. The bones were extremely decayed, and in most cases had so disintegrated that no specimens could be saved. In one burial at the moment of uncovering the body by the falling away of the earth a skull was found retaining the hair in excellent preservation, tied with a human hair cord at the sides of the head. (See Plate 86.) The skull, however, fell to pieces in a few minutes. Small balls of clay like marbles were found in the graves. Beads and ornaments were almost lacking, and only one small oblong of turquoise was encountered. Pahos also were not seen. Many of the burials were without mortuary offerings, and rarely more than three pottery vessels were taken from a single interment.

The pottery is yellow and as a rule is inferior in quality to the fragments scattered over the ruin. In deep diggings at the bottom of the talus some burials had only gray and a little red ware. On the slope below the mesa at the east side of the pueblo in indurated sand at a depth of 3 feet were found four pieces of black and white ware, consisting of a vase with animal handle, a cooking vessel with handle,

a cup, and bowl. The vase contained black and white beads of stone and shell, tablets of red stone, and pottery ornaments all pierced for stringing. Parts of a child's skull and femur were found near by, but no bones were directly associated with the pottery, and extensive diggings brought to light no other burials or remains at this place.

Some work was done at Nesheptanga,^a a ruin of fair size, in the neighborhood of Kokopnyama, situated on the mesa about 100 yards from Maupin's store. The buildings conform to the mesa edge toward the west and the village terminates to the east in a wall crossing the mesa. Fragments of fine yellow pottery are scattered over the ruin. Burials were made among the rocks in débris from the village. The cemetery among the rocks below the mesa had been dug out by the Navaho, and few specimens remained. Several smaller ruins a few miles west of Nesheptanga were inspected. One of these of good size is located on the mesa at the head of a long gulch leading into the Jettyto Valley. The ware here is yellow and of good quality. A smaller ruin in the same neighborhood showed fragments of large napiform vases characteristic of Tusayan. The small sites showing gray and red ware presented few features of interest. The ware is coarse, and it is apparent that the inhabitants were poor. The presence of ruins of this class in Tusayan, however, is interesting. (See p. 332.)

The ruin called Lululongturqui, located across the Jettyto Valley from Kokopnyama, was carefully examined, but not excavated. It is of medium size and has a commanding situation on the mesa. The mound stands high, and the village plan shows a rounded outline, reminding one of some of the Canyon Butte ruins. Adjoining the village in the north quarter are many oblong garden plots bounded with lines of stones. It is an interesting fact that the pottery of this ruin, while mostly gray and light red, has a fair proportion of fine yellow, either indicating that the people making the red and gray ware were contemporaneous with the makers of yellow ware or that the latter supplanted the former. Unfortunately the evidence of the graves could not be obtained. The Hopi name of the ruin is worthy of remark. Some work had been done here by the Navaho, and it appears that burials had been disturbed close to the town walls. Two small ruins with coarse red and gray ware one-half mile east of this ruin on a branch of the Jettyto Wash were visited. These ruins had been worked by the Navaho and a few pieces of pottery taken out.

CHAKPAKU.

About midway between Kokopnyama and Kawaiokuh lies a very large ruin called by the Hopi "Chakpahu," Speaker Spring. It is located on a spur of the mesa and overlooks the Jettyto Valley and a

^a Mindeleff's "small ruin between Horn House and Bat House."

deep gorge to the west. The ruin was surveyed by Victor Mindeleff in 1885.^a The prominent features of the ruin are the defensive wall and the great court or plaza which overlooks the gorge. No walls are standing, and the house plans can in few cases be traced among the mounds of rubbish. Vast quantities of potshards are mingled with the débris. The ware is of the finest quality, the best in texture and decoration to be seen on any ruin in Tusayan. The prevalence of fragments of large napiform vases at Chakpahu is noteworthy. The shards are bright and fresh looking as though recent. Many superb specimens from this ruin have gone into the various collections made by Mr. T. V. Keam. The cemeteries, which were in the débris between the houses and the mesa, have been rifled by Navaho. In 1893 the spring below the mesa was dug out by the Navaho, and many vases and vessels of various forms, like those found by the Museum-Gates expedition at Kawaiokuh, were encountered. A short account of this find, with illustration, was published by James Mooney.^b

A ruin furnishing yellow ware is said to exist on the south side of the valley, nearly opposite Chakpahu, where Maupin's new road descends the mesa. The ruin was not seen, but some specimens were bought of Navaho, one a canteen in yellow ware, with ancient decorations, and shaped like those used by the Hopi.

KOKOPNYAMA.

There is at Kokopnyama, as may be expected, a preponderance of useful forms in pottery, represented by bowls, vases, dippers, cups, and cooking utensils. Large water vases, with rugose surface, without decoration, are also represented here, but in limited numbers. The concave disks of pottery, with holes punched around the edge, are almost lacking at Kokopnyama. It is conjectured that these objects may have been used as revolving rests for ware during the process of manufacture, as are the tabipi or bottom forms, employed by the potters of Hano at present. A portion of this customary imperforated disk, with clay still attached to the concave surface, was found in this ruin.

A vessel of very thick ware, showing traces of fire, is believed to have been a brazier, in which coals were kept alight. I have observed such vessels in use among the Zuni.

Small objects of pottery were somewhat numerous, such as toy cups and bowls, frequently unbaked and showing the touches of childish fingers; a rattle with perforated globe, clay balls, toy dippers, and a number of animal handles representing the wildcat, badger, mountain sheep, wolf, etc. One of these, probably a wolf, is covered with a

^a Eighth Annual Report of the Bureau Ethnology, p. 52 (map faces p. 26).

^b American Anthropologist, July, 1893, p. 283.

thick enamel caused by fusing in the fire at great heat. A few disks worked from pottery fragments, and a fragment bearing the lug of a canteen reground in the shape of a frog, were encountered. Spiral appliqué ornaments for pottery, like those on Zuñi cooking pots, were used here, as fragments attest. It is worthy of remark that the minor works of pottery mentioned are fewer and somewhat ruder than those found in the ruins to the west.

Objects of shell are extremely rare in this ruin, a few unworked bits, a fragment of a large armlet, and a few conus and olivella beads being the sum total secured.

Worked bone is also scarce, with the exception of small awls. A few bone beads, small tubes, and a rib knife were taken from the excavations.

Stone implements are numerous here. Flint cores, arrowheads, knives, scrapers, flakes, and drills represent objects and materials of chippable stone. The workmanship, however, is poor. Spherical hammer stones, grooved hammers, an ax hammer, a simple grooved ax with poll, and a double-bitt ax were taken out. A sandstone upon which are grooves made in sharpening paho sticks, arrow smoothers, rubbing stones, small mortars and pestles, and pottery polishing stones were collected. Fragments of hand stones for grinding corn were seen, but no flat grinding stones were found in place in the rooms and very few were observed on the surface, though undoubtedly they were in constant use. The absence of surface relics of this character is due to the proximity of these ruins to the inhabited pueblos, who find use for many things abandoned by the ancients.

Several stone spheres, of a size suitable for club heads and probably originally put to that use, were secured.

Ironstone concretions of many interesting forms weathered out of the sandstone ledges are scattered in the débris of this ruin. A few in the collection have been worked in improvement of the suggestive natural form. These usually take the shape of miniature, well-finished cups. A curious toy grooved hammer of sandstone, painted red, was taken from the débris of a room.

Ornaments were made from a white limestone and a fine-grained clay stone of good red color. Thin disks of the latter stone, with perforation near the edge for suspension, are numerous. Turquoise was practically absent at Kokopnyama. Two fragments of tubular pipes were secured, one of beautifully banded stone and the other of pottery. Selenite fragments were scattered through the débris, also a few chips of obsidian and chalcedony like that of the Petrified Forest.

Of pigments, numerous examples occur at Kokopnyama. The most abundant is a dark red derived from the "bone" in burnt lignite and from the clay stone used for ornaments; yellow occurs as yellow ocher and ocherish clays, green as copper carbonate and arena-

ceous clay, and white from decomposed chalky limestone. Several fragments of dark brown iron ore showing marks of rubbing are examples of the stone used by potters for the brown pigment.

Bones of small animals were very scarce in the *débris*. Those found were principally of the two species of rabbit. Bones of the dog, fox, eagle, and turkey were also observed.

Numerous specimens of textiles were discovered in the cemetery during the excavations at Kokopnyama. Matting of twilled weaving was commonly employed to envelop the body preparatory to burial. In contact with the body also was found a very interesting textile, if so it may be called, but more resembling a rather thick felt of downy feathers, presumably of the eagle. This cloth was usually found on the face of the dead and is never of large extent. It may have been a mask of down for which cotton was substituted at a later period. Dr Fewkes mentions mortuary masks of cotton as having been traditionally used by the Hopi. In one instance a twisted two-strand cord of hair still binding masses of hair was found. (Plate 86, figs. 1 and 2.) A number of specimens of coiled and wicker basketry were taken out. (Plate 87.) The coiled basket is of close, fine work, and will be described by Professor Mason in his forthcoming work on basketry. The wicker basketry is of the ordinary type at present made at Oraibi. Several knots tied in yucca-leaf strips are shown in Plate 97, fig. 2. A thick lock of hair bound with yucca and saturated at the basal end with red pigment is thought to have been a brush, perhaps a brush for producing spatter work on pottery.

Beans of a long variety, corn, and squash seed and indistinguishable remains of food were found with the dead.

The absence of fetishes of worked stone is not unusual in the ruins of northeastern Arizona, but the absence of *pahos* with the interments at Kokopnyama is remarkable. It must not be said, however, that the Kokop people did not employ *pahos*, for the most important cemetery, which has either been swept away or is yet undiscovered, may have contained them. Still, the lack of *pahos* with the burials in the extensive ash talus of the pueblos must be taken as positive evidence, proving a considerable variance from the neighboring pueblos to the west in this respect.

KAWAIOKUH.

This very large ruin is situated much as Chakpahu, on the top of the mesa between two gorges. It lies a short distance to the west of the Keams Canyon road, where it reaches the level of the mesa, 2 or 3 miles above Jettyto Spring at the "Rock House." (See Plate 82.) Communication is rather easy over the level mesa to Awatobi, near which is a Hopi settlement around a fine spring.

Kawaiokuh has a commanding position, giving an extended view up

and down the Jettyto Valley. (Plate 88.) Juniper trees come close to the ruin and are abundant on the mesa, not having been consumed for fuel, as near the present Hopi towns. This is due, perhaps, to the use of lignite at Kawaiokuh. During the winter the Navaho move up from the valley to their hogans among the junipers, where fuel is convenient and snow furnishes water. Many varieties of plants grow on the mesa, which at this elevation (6,200 feet) assumes the aspect of the White Mountain slopes.

In the gorges below the ruin are seen springs which hold out for some time into the dry season. Jettyto spring issuing from the shales at the base of the mesa is permanent, and no doubt furnished water for Kawaiokuh, though at the cost of much labor in bringing it up to the pueblo.

The front of the village was built close to the edge of the mesa, though enough space was left for passage around. The rear of the village is comparatively straight.^a The houses near the edge of the mesa were several stories in height, and some of the rooms were large and well plastered with red clay mixed with sand. The walls of a room excavated were covered with numerous coats of plaster, on the surface of which various designs had been painted in color. (Plate 89.) The floors were broad slabs of flagstone. The masonry is of small cubes of sandstone laid in mud and shows inferior workmanship like that of the present pueblos. No scattering houses were to be seen around the pueblo nor were there traces of shrines or pictographs.

On the bench below the cliff a pottery-burning place was discovered, and by carefully removing the layers of soil the bed on which the pottery was set up was exposed. (Plate 90, fig. 1.) This layer was made up of ashes mainly composed of the slaty portions of the lignite burning white or red. There were bits of white sandstone also, and charcoal of twigs and stones. Near this spot was unearched a heap of fragments of vessels broken in firing. (Plate 90, fig. 2.)

Kawaiokuh has been devastated in a thorough manner by the Navaho, and there was grievous evidence that their wasteful methods had destroyed far more than was saved. The burials in which the finest ware had been placed were found in the débris among the rocks at the foot of the cliff and extended entirely around the front of the pueblo. The slope at the west side of the village above the gorge had also been an important cemetery. There is no cemetery at a distance from the pueblo, as at Awatobi, and it appears that the latter pueblo is unique in this respect among the related Jettyto ruins.

After numerous trial excavations it was determined to clear out one of the higher house masses on the edge of the mesa. Very soon in the course of this work it was discovered that the front rooms had been devoted to burials and eventually a considerable collection of pot-

^a See Mindeleff's plan, Eighth Annual Report of the Bureau of Ethnology.

tery, etc., was taken out. As many as eight interments had been made in one room at different levels. (Plate 91.) A large coiled jar, sealed with clay and having the rim of a fine vase luted on, was unearthened beneath the stone floor of a room. (Plate 92.) The jar contained only a quantity of clean sand in pellets, the grains loosely cohering in globular form as though arranged by some obscure natural process. This deposit was perhaps of sand for ceremonial purposes. Offerings of corn, beans, cotton seed, etc., accompanied these burials. The skeletons were decayed beyond preservation. The burials below the mesa held the ware of the finer class almost exclusively, so far as could be ascertained from the fragments of beautiful texture and design left by the Navaho around their excavations. A few interments that had escaped the Navaho were encountered during the work. Mats of yucca strips were wrapped around the bodies and these placed on wicker trays or constructions of small twigs. Food offerings of young corn ears and bread were placed on coiled baskets and numerous elaborate pahos arranged around the body. It seems plain that the important cemetery was at this location, and it is regrettable that so little remained where there had been so much valuable scientific material. With the specimens from the house cemetery, however, and those from the excavations in the débris and from the surface of the ruin a considerable collection was formed, containing many interesting objects.

In the neighborhood of Kawaiokuh are several small ruins yielding gray ware, a specimen of which is shown on Plate 95, fig. 1. While in camp here a Navaho brought in two fine pieces of this class from a ruin, described as large, in the Moki Buttes, about 25 miles distant. One of these pieces is a large globular vase well decorated.

Artifacts, Kawaiokuh.—The remark as to the useful forms of pottery vessels at Kokopnyama applies also to this ruin. A greater number of specimens were collected at Kawaiokuh than at the former site, and as noted the æsthetic ware is more abundant; likewise, there are many small objects of different classes showing that the potters' art was quite diversified in this pueblo.

In detail, attention may be called to a small vessel in form of a frog; the ware is fine yellow, and the modeling is aided by decoration in dark brown (Plate 93, fig. 1). Another of this class is a vase in form of a parroquet, of excellent workmanship and decoration (Plate 94). A vase of gourd form also displays much taste, and a vase of the oriental "pilgrims' gourd" shape, a form rare in this region, is represented in the collection. An oblong canteen form, from which the handles have been broken, bears a symbolic decoration on the sides, and at the ends conventionalized faces. (Plate 93, fig. 3.) A well-formed dipper in perfect preservation is shown in Plate 93, fig. 2.

A vase of gray ware with spiral decorations on the shoulder (Plate

95, fig. 2) was taken from the house cemetery at Kawaiokuh. The ware is remarkably thin, so much so as to raise the question whether the vessel could have been made by coiling, and yet there seems to be no alternative.

A bowl, one of several, of salmon color (see Plate 100, fig. 2) must be mentioned. The paste is dense and of the same fine character of the ware from this region; it is probable that to produce this color either a little yellow ocher was added to the clay or the clay was selected for the purpose. In either case the bowls have the look of strangers amidst the fine ceramics of Kawaiokuh; especially is this remarked when one considers the rudely drawn design in brown bordered with white, a style extremely rare in ancient Hopi pottery, where white is not a potter's pigment. White-margined decoration is found at Honolobi, and in many of the ruins along the White Mountain plateau it is common. Possibly the woman who made these bowls was following the traditions of the potters of her clan, which may not have been represented at Kawaiokuh except by herself.

The fancy of the potter was expressed in many small works, as in the handles of the cups and vases, which often represent animals with accuracy and again with grotesque or humorous treatment. The handle of a cup (Plate 93, fig. 4) is an example of the latter. By setting the mouth of the animal at an angle a peculiarly whimsical expression was produced by the artist. Figurines of a dog going on three legs (Plate 96, fig. 12) and of the same animal apparently curled up in sleeping posture were found. Ornaments in shape of birds perforated for wearing are frequent. (Plate 96, fig. 11.) One of these in the collection is a superior piece of modeling; the tail and extended wings are vaned by notches pressed in the clay and the body is decorated. (Plate 96, fig. 9.) Small ornaments in shape and decoration designed to imitate shells are also frequent. (Plate 96, figs. 7, 8, and 10.)

Pottery bells like those found by Dr. J. Walter Fewkes at Awatobi^a and first described by him from this region are somewhat numerous here. They are hollow spheres, having a narrow aperture like the sleigh bell, and as to devices for fastening to a cord or to garments are of two classes; one with a perforated tang, and the other having a pair of holes opposite the aperture. One of these specimens retains the pellet of clay forming the sounder and on being shaken produces an agreeable tinkling sound. These bells are undoubtedly of aboriginal manufacture.^b

^aSeventeenth Annual Report of the Bureau of Ethnology, p. 629.

^bDuring a meeting of the Anthropological Society of Washington, at which the results of the Museum-Gates expedition of 1901 were presented, the question of the aboriginal origin of the so-called hawkbell was canvassed, the evidence presented going to show that such bells are prehistoric on the American Continent, although at an early date bells of a similar form were articles of trade, being in universal demand by the native tribes and scarce with them at any period.

Toy pottery vessels are plentiful, representing vases, cups, dippers, and bowls; one in form of a gourd, and one miniature vase of gray ware of excellent form and finish should be mentioned. A pottery object in form of a hollow cone, with perforations around the base, is supposed to have been used as the nose of a mask. Several tubular pipes (see Plate 52, fig. 4) were taken out.

Hundreds of fragments of the concave disks of rude pottery with perforations around the edge, indicating a diameter of from 8 to 12 inches, were seen in the débris. (See p. 337.)

Among the pottery objects found at Kawaiokuh is a fragment of a thick rectangular slab, with two shallow saucers in the upper surface. From traces of adhering color, this was no doubt used for mixing paint.

Stone working at Kawaiokuh had not reached by many degrees the perfection attained in clay working. This remark is true for the whole Pueblo region, where the worked stone is much inferior to that of the ancient inhabitants of Ohio. Still, in the Pueblo region, there was considerable variation in workmanship among the different tribes and also in some lines, as in mosaic and bead making there was great proficiency. It must be said that for careless and crude manufacture of stone implements, the tribes going to form the Hopi complex were among the first, though on the other hand quite a variety of implements, ornaments, etc., were fashioned of stone.

The primitive spherical hand hammer is common at Kawaiokuh, where it was employed, no doubt, for battering corn mills, etc., as it is among the present pueblos, where the writer has observed it in use.^a Grooved hammers of different sizes are also found. The large grooved hammers seem to have been used in wood gathering; they are sometimes met with among the juniper trees at a distance from villages. Axes, sometimes double-bitted, had their principal use also in getting out beams and chopping wood. Occasionally ceremonial implements in the form of highly polished axes and hammers of actinolite, a beautiful and much-prized stone, are picked up on the ruins. Two fine specimens of this character were secured from Sa-a-la-ko, the chief Snake woman of the Hopi, mother of the leader of the snake fraternity of Walpi. Aside from actinolite, the material of hammers and axes is chert, sandstone, and basalt of inferior quality.

The arrow smoothers from this locality were made by securing a suitable piece of stone, dressing down a face, and making a groove across it. The materials are coarse and fine sandstone, claystone, and soapstone. This implement must be divided in two classes, one in which the arrow-shaft was smoothed by attrition, and the other in which when the stone was heated the shafts were straightened. In the latter class often a companion stone, also grooved, was placed over

^a American Anthropologist, X, June, 1897, p. 191.

the shaft and the latter drawn to and fro through the channel. Small cup-shape mortars of coarse sandstone were found at Kawaiokuh and a slab of fine-grain sandstone with shallow cavity in which iron paint had been trituated. Pottery-smoothing stones are numerous, and small slabs of fine grit wood opal, used presumably in stone working, were picked up. There were also cylinders of coarse stone, probably employed as rasps.

Ornaments in form of round and oblong tablets of red-clay stone like that used at Kokopnyama are shown (Plate 96, figs. 1-3). A drilled tablet of buff limestone is also shown (Plate 96, fig. 4). A small object of hematite, neatly carved to represent a wolf and having a hole drilled through it for suspension, is probably a fetish (Plate 96, fig. 6).

The arrowheads at this site differ very much in size from slender specimens three-fourths of an inch in length to those $2\frac{1}{4}$ inches in length. Many of them are serrated; such arrowheads are common in northeastern Arizona. The materials are various—chert, quartzite, quartz, agate, jasper, obsidian, and chalcedony. A number of knives were collected, mostly rudely chipped, though some show rather good work. Scrapers consisting of irregular spalls of chert, chalcedony, and obsidian worked on one edge are numerous. Obsidian is more plentiful at Kawaiokuh than at the neighboring ruins. Several perfectly formed chips found in the débris are believed to have been used as miniature mirrors. The Navaho are familiar with such use of obsidian flakes.

No crystals of quartz commonly found in the pueblo ruins were observed at Kawaiokuh. A few beads of fine turquoise were picked up in the débris, but no specimens were placed in the graves.

Several chipped fragments of vitreous stone, some of which seem to have been fused, were thought to be artificial, or rather to have been produced by accident in burning pottery at a high heat.^a We have seen that fused masses of green enamel sometimes occur on fragments of pottery among the ashes at the pottery-burning places, and suggest that the people of Kawaiokuh were near to the independent discovery of glass.

Objects of shell are comparatively few at Kawaiokuh, although there is much more here than at Kokopnyama. Among the specimens secured were a fragment of shell pendant, a fragment of amulet drilled for a pendant, conus and olivella tinklers, a small circlet cut from a pectunculus shell, and a circular ornament with scalloped edge having a hole cut through the center.

Small bone awls like those used by the Hopi for basket work and sewing are common. Tubes of bird bone and of a few deer bones cut off with flint were collected. One of these tubes has a hole cut through

^a This mass has been tested by Dr. George P. Merrill and is found to be a slag.

the wall near one end and was probably made for a whistle. The tips of an antler and several other bones appear to have been employed in flint chipping. A circular ornament cut from the skull of some animal and having a hole near the edge for suspension was taken out.

The pigments used for various purposes at Kawaiokuh were found to be similar to those collected at Kokopnyama.

Wicker and coiled basketry like that described from Kokopnyama was made at Kawaiokuh (Plate 97, figs. 1, 2, and 4). The bed or mat of twigs often placed beneath the more important dead was, as far as the condition of the specimens allow to be made out, constructed of interlaced shoots of *Rhus trilobata*, the ends of the shoots turned in and thrust among the interlacings forming an edge. Matting of yucca, the making of which has been long discontinued among the Hopi, was also used to enwrap the dead, as shown (Plate 97, fig. 5), where remains of matting adhered to the lower jaw of the skeleton. Strips of the fibrous leaf of the yucca were used for tying.

Specimens of the felt-like masks of the down of birds were also collected at Kawaiokuh, as at Kokopnyama. (See p. 339.)

Squash seed, beans, corn, and cotton seed were found in the graves. Sometimes a bunch of ears of corn, probably roasted and secured together by the husks for hanging in the house as the Hopi do at present, were uncovered. The cotton seed resembles in size and appearance that still raised by the Oraibi at Moenkopi.

The offerings of prepared food to the dead in the ancient ruins are rarely in such condition as to admit of identification. At Kawaiokuh, however, one of these offerings was plainly a round, thick tortilla, such as the Hopi call pilabaki.

While at Kokopnyama pahos seem to be absent; at Kawaiokuh they are numerous in the graves and are the only wooden objects that have been preserved. It may be said that the cause of this is the carbonate of copper pigment with which the pahos were covered. Three kinds of pahos were noticed—one a short, slender stick sharpened at one end; another larger, with carved head, and still another a stout rod having a flat tablet fastened to the upper portion.^a No traces of other colors than green are observable on these pahos. Remains of pine needles and feathers still adhere to the tablets, and in one case the small mass of meal (nūsha, "sustenance"), customarily added by the Hopi to certain pahos, as those of the flute society, was preserved.

In regard to the distribution of pahos in this region, it may be said that while they are sparsely represented in the ruins of the Little Colorado Valley and the north side of the White and Mogollon mountains, they are most numerous in the ruins around Hopi mesas, especially in the latter ruins. In the excavation of Old Wolpi,

^aSee Seventeenth Annual Report of the Bureau of American Ethnology, pp. 736-739, for pahos found by Dr. Fewkes at Awatobi and Sikyatki.

Mr. C. L. Owen, of the Field Columbian Museum exploring party, took out many hundreds of these interesting objects, proving that here is the center of greatest prevalence of pahos. The origin of the custom can not be ascertained as yet, nor is there data as to its extent in the Pueblo region. Presumably the elaborate pahos were an accession from the Rio Grande coming in with the complicated Katchina ceremonies.^a

PERIODS OF TUSAYAN WARE.

It may be well to notice here the characteristics of the ware of the different periods as marked by the incoming clans. The settlements of the first period are small and obscure and have not been excavated. From surface indications, however, it is found that the ware is rather coarse, and that there is a greater proportion of gray and red ware than in later ruins. The small sites showing only gray ware and red ware have been mentioned, and these may indicate early clans with the technic of the San Juan region. To the north and west of Tusayan such ruins are numerous, coming close down upon the area of the yellow ware. The traditional Hopi ruins at Black Falls, discovered by Dr. J. Walter Fewkes, are of this class.^b The decoration of this ware is geometric, and animal forms or symbolic figures are almost lacking.

The second period begins with the initial coming of the clans from the south. These people are well represented at Homolobi, near Winslow, Arizona, where exist a group of ruins explored by Dr. J. Walter Fewkes and the writer in 1896, and the group near Biddahoochee, described in this paper (p. 326). Here we find a considerable diversity of color and quality of ware. The fine yellow ware is well represented, but we have gray ware, red ware, polychrome ware, and coiled vessels with marked coiled decoration different from the obscure coiling of the ruins near the Hopi mesas.^c

The decoration is geometric, but not derived from the same motives as in the gray ware of northern localities. There is more fertility of invention in handling motives which are in a transition from more complex symbolic subjects in the main primarily realistic. This gives, for example, the interior decoration of bowls a greater variety in the matter of placing the design over the whole area, whereas in the black-and-white northern ware the design is usually arranged in four areas between the arms of a cross, leaving a square or circular field in the

^a Most of the traditions ascribe the introduction of prayer sticks to the Water House people of the South. See Fewkes, *Tusayan Migration Traditions*, Nineteenth Annual Report of the Bureau of American Ethnology.

^b *American Anthropologist* (n. s.), II, July-Sept., 1900.

^c The migration from the south has also been in progress for a considerable period, extending up to comparatively recent times. It must be said, however, that these clans brought with them pottery that appears to be more ancient in type than that brought by the Rio Grande clans.

middle of the bowl scarcely ever occupied by a symbolic design. The designs are almost invariably angular and rarely undertake the voluted or curved designs of other regions.

Invariably, also, the ancient Hopi ruins are richer in shell, turquoise, and objects of aboriginal art than other ruins of the Southwest.

The extent of the impress upon the Hopi of the art of the clans coming from the south is not clear at present, as the ancient sites have not been explored to any extent. In the summer of 1901 Dr. George A. Dorsey and Mr. C. L. Owen, of the Field Columbian Museum, excavated on the site of Old Walpi, the "Ash Heap," as it is called, securing a large collection, which, when it is available, will probably throw light on the transition period.

It appears that comparatively recently the potter's art died out among the Hopi of the Middle and East Mesas and that by the law of village specialization of an art, Oraibi retained the making of pottery until shortly after 1872, when Dr. J. W. Powell visited the pueblo. The later Oraibi art shows marked Zuñi influences. The Tewans, however, practiced the art uninterruptedly, and it has come to be that the people of Hano are the only potters remaining in Tusayan, and that finally, at the close of the fourth period, the pottery used by the Hopi is of Rio Grande extraction, even though it has become thoroughly debased, like many of the arts of the American Indians. Nampeo, an intelligent Tewan woman, however, is endeavoring to revive the glories of the former times.

The third period, the golden age of Tusayan, begins with the great migration from the Rio Grande. To this period belongs the splendid ware procured by Dr. Fewkes at Sikyatki and Awatobi,^a the Keam collections at Peabody and Chicago, and the collection from Jettyto Valley by the Museum-Gates expedition.

In texture and decoration this pottery is the best in North America and ranks with the finest of Mexico and Peru. In decoration it is perhaps superior, for it must be remembered that the highest efforts of the potter in those countries belong in the class of sculpture, which is hardly represented in Tusayan, nor indeed in the Pueblo region, except where it connects with the Mexican culture on the southern border.

The ware of Jettyto Valley is preponderantly yellow, ranging from cream color to yellow ocher and occasionally reaching orange. Brown and salmon color also occur, with a few sporadic examples of gray and red.

The texture of the ware is fine and homogeneous; the absence of sand or *dégraissant* is notable, which speaks well of the cretaceous clays that occur as partings in the sandstone rocks of the region. These clays also contain little iron and that is such chemical form as to

^aSeventeenth Annual Report of the Bureau of American Ethnology, Pt. 2.

impart only a yellowish tint of great beauty to the burnt ware. The clay burns to remarkable density and stands a high heat in the kiln. Sometimes overburning produces a paste with the hardness of stoneware, but high heat usually darkens the surface and obscures the design.

A lively appreciation of symmetry of form is evident and the surface finish shows the greatest care, no part being slighted, differing in this respect from the gray ware of the north, in which the exterior surface and edge usually have not been treated with the polishing stone. On account of the careful finish of the Jettyto ware no traces of coiling or other processes may be seen; in fact, the potter was careful not to have even marks of the smoothing stone on her vessels, so that the surface is agreeable to the touch, like polished ivory. Not having received any surface wash of clay, the vessels are never cracked.

There is no doubt, however, that the structural method of coiling was practiced and that the basal processes were similar to those employed by the potters of Hano at present.

The pigments, also, were of iron ores and earths, like those used by Nampeo at Hano. These are *tóho*, or ironstone and *sikyátóho*, or yellow ochre; in unskillful hands these produce, the former dark brown answering to black, and the latter dingy reds. Nampeo has in her recrudescence of the old art found it necessary to select these pigments for various qualities, depending on the purity or impurity of the material, or just as she also selects her clay. Her efforts, while commendable, serve to heighten our appreciation of the discrimination of the ancient potters in selecting and handling their materials. Their command of the resources of color may be observed in Plate 98, fig. 2, where on an old ivory ground may be counted seven graduations of yellow, red, and brown; fig. 1 of this plate is also a fine example of color and texture. These graduations are intentional and show a knowledge of the behavior in firing of these colors.

Colors were not only put on in broad masses over portions of the design, but areas of the vessels were spattered with delicate tints of red, brown, and yellow, shaded from the edges toward the center with great taste. Areas of color were frequently stippled, apparently with the yucca brush, and sometimes color was applied using the end of the finger as a pounce. Masses of dark color were relieved or made more specific as to meaning by scratching away the color with a sharp point as in etching. In one example found at Kawaiokuh the representation of a mask is covered with raised work in color, the pigment having been thickened to form a mass. These examples, which probably do not comprise all the manipulations with which the Jettyto potters were familiar, are enough to place them in the category of the most advanced pueblo artists.

It must be said also that in drawing they take high rank in that they displayed an appreciation of the quality of lines and attacked complex subjects, which they rendered with accuracy, freedom, and boldness.

Their colors were applied by means of a slender strip of yucca leaf, as a rule, where accurate work was sought. In some cases, however, there is evidence that a larger, soft-ended brush, possibly of hair, was used, and the design painted on hurriedly and roughly. It is true that the pottery of any one of these pueblos furnishes examples showing varying degrees of skill, though the average is high for pottery of the better class.

AGE OF JETTYTO VALLEY RUINS.

It is fortunate that the dates of the discovery (1540) and of the destruction of Awatobi (1700) are known. From these dates it is possible to approximate the age of the related pueblos and to get a clue as to the period of the migrations from the Rio Grande. These migrations extend over a considerable length of time, but there is traditional material relating to all the settlements, portions of which have been collected by J. Walter Fewkes^a and A. M. Stephen.^b

Previous to the year 1700, when the last migration from the Rio Grande brought the Tewans of the present town of Hano, many clans from the east settled in Tusayan. One comparatively late migration was due to the unsettled conditions on the Rio Grande caused by the pueblo insurrection of 1680. These migrants founded the pueblos of Payupki and Tebungkihu, now in ruins near the East and Middle Mesas. They withdrew again to the Rio Grande at the instance of Padre Menchero when the trouble had passed.

The settlements at Sikyatki, Awatobi, and the other great Jettyto towns were more permanent and endured to all appearances for several centuries. The first Rio Grande migration undoubtedly antedates the conquest (1540); it may not be possible, however, to determine the length of time beyond that date that the Jettyto pueblos were occupied. In 1540, when Awatobi was visited by Tobar, it was a village of 800 souls, the only Hopi village besides Oraibi, then located on a mesa.^c Later visitors to Awatobi were Espejo, 1583; Oñate, 1598, and Vargas, 1692. In 1700 it was destroyed by Hopi from the pueblos a few miles to the north, having remained on its

^aIn various reports of the Bureau of Ethnology, *American Anthropologist*, and *Folk Lore Journal*. Quite a full account may be found in the *Seventeenth Annual Report of the Bureau of Ethnology*, to which I am indebted. See also the recent paper on Tusayan migration traditions, *Nineteenth Annual Report of the Bureau of Ethnology*, 1901.

^bEighth Annual Report of the Bureau of Ethnology, 1886-87.

^cJ. W. Fewkes, Report, Smithsonian Institution, 1895.

location for one hundred and sixty years during the historic period, and inferentially having been built long before 1540. At that date, also, the three very large pueblos to the east of Awatobi, and also Sikyatki, had been abandoned, as Tobar makes no mention of them. This, of course, is negative evidence. It seems likely, therefore, that, as Dr. Fewkes has suggested, this migration probably occurred in the fifteenth century.

The impression the writer received on the study of these ruins is that Kawaiokuh^a and Chakpahu were contemporory with Awatobi. Like Sikyatki, they mark the period of the highest development of the potter's art in Tusayan. Kokopnyama, however, seems older; the pottery is not so good and it is possible that it is the first settlement in this region from the Rio Grande. The important clan of the Fire or Firewood is known to have lived at Tebungkihu and Sikyatki;^b it may be that Sikyatki was settled from Kokopnyama. The pottery of Chakpahu is the finest to be found in Tusayan. This pueblo was the center of the manufacture of the splendid napiform vases characteristic of this region, and innumerable beautiful fragments are to be seen in the débris. At Kokopnyama sherds of such vases are very few; at Kawaiokuh there are about as many as at Awatobi. The ruins of Sikyatki have furnished some fine examples, figured in Dr. Fewkes's monograph.^b

One of the most beautiful specimens in existence, taken out by an Indian at Chakpahu, was secured by Mr. P. G. Gates in 1901.

If there were no traditions among the Hopi relating to the five pueblos mentioned, comparative methods would show that the bold symbolism on the pottery relates them to the Keresan pueblos, which furnish the only ware among the present village dwellers that is similar in style of ornamentation. We may conclude, therefore, that superior ceramics, both in texture and decoration, were brought to the Hopi from the east as early as the fifteenth century.

The main feature of interest in this connection is the extent to which the Hopi culture has been modified by that of the Rio Grande peoples. The region of the upper Rio Grande, with its superior advantages as to food supply, due to the abundant water, has been the cradle of pueblo culture, and to these favorable conditions, as well as its position on migration lines, it may have received the first settlements of hunter tribes forced into the pueblo region. Undoubtedly these conditions have determined the perpetuation of the majority of the existing pueblos. From this region we would expect various populations to swarm in search of new homes. The Navaho also were modified for their betterment by contact with the Rio Grande culture and by racial

^a Mr. F. W. Hodge informs me that this is also the Keresan or Queres name of the pueblo of Laguna.

^b Seventeenth Annual Report of the Bureau of Ethnology, Pt. 2.^c

mixture with some of the clans, through whom, no doubt, they received sheep and their first lessons in pecudiculture.^a

The original Hopi clans, the Snake and Bear, forming the nucleus of the settlement, traditionally came to Tusayan from the northwest and southwest at an early date, possibly as early as the fourteenth century. This marks the end of the wanderings of those clans, the location having many permanent springs and the stream beds giving fair opportunity for agriculture. It is not the country that civilized man would choose for a habitation, but to the Indian its isolation gave safety and the desert gave subsistence to those who knew the field craft for the desert.

There can scarcely be more than conjecture as to the origin of these early clans. From the language they were of the great Uto-Aztecan stock, which forms at this day the largest linguistic family on the Western Hemisphere. The history of this family is comprised in less than four centuries since the conquest, and tradition in Mexico, where the tribes reached their greatest efflorescence, places their migration from the north at two centuries before the conquest. Cubas places the first "king" at 1352.

There is little doubt that before the date of the entrance of the Aztecs into Mexico the Pueblo region possessed its characteristic culture. Whether this culture was environmental (Brinton) or an outer wave from the great ancient cultures of Central America, or both, is an open question.

The Shoshoneans, like the Navaho, came in contact and union with pueblo tribes at one of the early centers of population, presumably in southeastern Utah or northern New Mexico. Here they received a modifying element assimilating them to pueblo culture. It might not be going too far to say that Nahuatl incursions into Mexico from the north were filtered through the Pueblo region; indeed it seems probable. The Hopi, then in their beginnings, may be regarded as a product of pueblo environment and culture upon hunting tribes of Shoshoneans whose virility fitted them to move about in the Pueblo region, preserving their organization and language. If it be true that the early tribes did not possess corn, but depended upon the chase, the most important, in fact a well-nigh essential, need was supplied by this food of foods, and the modifying effect was like that of the acquisition of sheep by the Navaho. Contact of the Hopi with cliff-dwelling tribes of Pueblo Indians is undoubted; the traditions hint at it, and the discoveries of George H. Pepper in northern New Mexico reveal basket-making tribes using symbolism familiar among the Hopi.^b In truth

^aF. W. Hodge. The early Navajo and Apache, *American Anthropologist*, VIII, 1895, p. 223.

^bThe Ancient Basket-Makers of Southeastern Utah, G. H. Pepper, *Journal of the American Museum of Natural History*, New York, II, Supplement, April, 1902.

it might be said that we have in the ancient inhabitants of Grand Gulch the Shoshonean prototype of the northern clans of the Hopi, or rather one of these clans in a state of modification as referred to.

The subsequent history of the Hopi after the Snake and other early clans settled in Tusayan is marked by the arrival of many clans from various quarters, consolidating into the Hopi complex as we find it to-day.

The more important of these superadded elements were the Rain, Lizard, and Rabbit groups of clans from the south, according to Dr. Fewkes, which have been traced at Homolobi and Biddahoochee, and the Badger, Horn, Tansy Mustard, and Katchina groups of clans from the east.

Attention is called in this connection to an interesting environmental phase of the names of the clans, which seems to work out beautifully in determining the location from whence they came. This is that the clans coming from the north and northeast, from mountainous regions where game abounds, bear the names of animals; while those from the south, or from less rugged and more cultivable regions, bear the names of plants, minor animals, or of the beneficent powers of nature. The clans from the land of the agave and the yucca palms lived in a milder environment and by the nature of things were more civilized than the clans who were forced to depend largely on hunting for subsistence. It will be seen that those facts must be taken in account in the study of the composition of the Hopi.

REMARKS.

TYPES OF BUILDINGS.

It was found that in few of the pueblos south of the Jettyto Valley examined by the Museum-Gates party of 1901 was there any care taken to locate in an inaccessible or defensible position. The care was rather to settle near the water supply, at a sufficient elevation merely to overlook the fields or to furnish a practicable site.

As a rule, the plans of the fifty-five ruins examined are of the ordinary rectangular type, offering little worthy of remark. The groups in the White Mountain region, however, which show in part circular plans, and some of the ruins of the Canyon Butte group, which approach this type, are interesting in connection with the range and affiliations of the widespread clans who employed a style of decoration on gray and red pottery that may be called the dual style, which will be discussed later (p. 354).

DISTRIBUTION OF PUEBLO CULTURE.

Last winter the writer presented a paper before the Anthropological Society of Washington, giving a summary of the field work of the

Museum-Gates expedition of 1901. In discussing the paper President W. H. Holmes characterized the Pueblo culture by saying that it was a great unit with much diversity in detail, fading off into but not connecting with the areas to the west, north, and east, save perhaps in case of a limited class of ancient earthenware decorated with color found in the States of Mississippi, Arkansas, and Louisiana; but on the south there is strong evidence that it connects with the art of northern Mexico and to some degree with the great culture centers of the southern plateau of Mexico. President Holmes said that the various ceramic groups were largely the result of local environment, and to some extent to the culture of peoples arriving in that environment, but the culture over the whole Pueblo area has been to some extent unified.

A few years ago the writer made a study of the art of pottery making carried on at the pueblo of Hano, on the first or east Hopi mesa. It was strikingly brought out in the course of this study that the environment for potter's materials is quite extended. For instance, one desirable clay was brought from the ancient quarry of Sikyatki, about 5 miles away, another from 10 miles or so, common clay from the partings in the mesa just below the pueblo, another clay of different character from some other place, and besides these four varieties, kaolin was brought from a long distance. Experiments were also made with clays encountered during journeys, and by mixtures clays were improved or regulated for certain classes of ware, as for the large water ollas which come from the primitive kiln a reddish-brown color. A similar discriminative selection was also observed in regard to the pottery pigments.

It will be seen that the potter's art at Hano is surprisingly complex in the matter of materials, not to speak of the other processes involved before the ware is finished.

So far as has been observed by the writer, the clays of this region as a rule burn to light yellow, or, in other words, it is an environment that would determine yellow pottery. Without doubt the three great types of pottery of the Pueblo region as to color have their origin in the geological environment in localities where the respective conditions obtain, but the decorated ware such as is taken from the ruins and exhibited in our museums stands very far from the beginning. These types have been more or less widely spread over the whole Southwest through the migration of clans. Thus we find gray ware almost exclusively, for instance, at the Scorse Ranch, where the country clays burn from yellow brown to light yellow. Hence kaolinic clays were sought out for use here because gray pottery was the kind sanctioned by custom and must be made even though the end be attained by passing a wash of kaolin over a body of dark color. It seems, therefore, that there is evidence of strong conservatism in the potter's art of the pueblos,

one which peculiarly belongs to the woman, who Professor O. T. Mason has shown are the originators and zealous perpetuators of many of the primitive arts. While without the evidence of the decorative symbolism and forms of pottery and that of other artifacts found in a ruin, it might not be thought advisable to depend on the color of the ware alone; yet, bearing in mind the strong conservatism of custom, this feature has classificatory value. Speaking now with regard to the art alone, we may provisionally class the pueblo culture in presumable sequence of origin as that of the gray-ware people, the yellow-ware people, and the red-ware people.

The region of gray ware is southern Utah, southern Colorado, northern Arizona, and northern New Mexico, and its range is much more extensive than that of any other class. The surviving people making gray ware are the Zuñi.

The region of yellow ware embraces the Hopi Reservation and the country south to the Lower Gila in the former range of the Hopi; in the southern portion of the region it occurs sparingly and crosses areas of red and gray. Acoma, Sia, and perhaps some other Rio Grande pueblos make ware which falls in this class.

Ancient sites furnishing red ware exclusively are rare. Red ware occurs in connection with gray, polychrome, and other classes. In general, the region embraces the White and Mogollon mountains, portions of the Gila, and has its focus in the Pima-Papago-Mohave country in southern Arizona.

RANGE OF DUAL DESIGN ON POTTERY.

In this connection attention is called to a style of decoration found almost altogether on gray pottery. The design is drawn in hachure and solid color; these areas of decoration being very often complementary, suggesting the idea of duality. (See Plate 31, figs. 3 and 4; Plate 32, figs. 5 and 6, Scorse Ranch ruins, and Plate 51, Canyon Butte Wash ruins.) This design may be seen on the palaces of Mitla, where it occurs in the frets figured by W. H. Holmes.^a It is believed that this style of decoration may be of importance in determining the range and affiliations of the tribes making use of it. An examination of the pottery of the existing pueblos shows that the dual or hachure design has been perpetuated only at Zuñi, and here also on the surviving representative of the ancient gray ware, still the typical pottery at Zuñi. The ruins of the Zuñi pueblos which flourished at the time of the conquest and the Zuñi ruin of Kintiel, so far as we have observations upon them, show this type of ware and decoration. The ruins south of Zuñi to the Rito Quemado; southwest, embracing the St. Johns-Springerville

^aArchæological Studies Among the Ancient Cities of Mexico, Field Columbian Museum, Anthropological Series, I, No. 1, Chicago, 1897, pp. 248-249.

region; Forestdale (see p. 289), in the Apache Reservation; the Tule-rosa and Upper San Francisco rivers, etc.; in general, the region south and southwest of Zuñi, with as yet undefined boundaries but manifestly an area of great extent, are of this class. As said by Cushing, the traditions clearly show that the Zuñi stock is made up of two elements, the one preponderating and more virile from the north, and the other from the south, which Cushing seems inclined to connect with the Yuman of the Lower Rio Colorado or the Piman stock.^a It may be said in passing that a census of the immense collection of modern Zuñi pottery in the U. S. National Museum includes a number of pieces of red ware, principally in form of bowls with polished surface, which remind one strongly of Pima pottery.

Little work has been done on Zuñi archeology, nor is the pueblo unique in this respect; so that the starting points, ancient migration lines, or stopping places on the way from the north or south are yet to be worked out. Perhaps this hint as to the dual and hachure design may serve as a clew in the further prosecution of this research, which presents only one of many problems that await elucidation in that fascinating field, the ancient Southwest.

SYMBOLISM.

There remains also much work to be done on the subject of symbolism, and like many other matters connected with the Indians, who are daily losing something of their old life, the time for this study is the present.

A world of symbolism painted on pottery lies beneath the ancient ruins of Arizona, besides that which has already been taken out by responsible and irresponsible parties. Nowhere has symbolism played such important part as in the pueblos of the Hopi group, and nowhere is the study of them so interesting, both on account of the fullness of the material and the relationship to existing peoples who to-day have a living body of symbols. Here is an advantage presented in the study of pueblo archeology over that of other regions in the United States. Representatives of the prehistoric peoples are still living in the region where the ancient clans wandered, preserving in some degree the ancient thought and in less degree the ancient arts. To them we may refer the finds taken from the ground with some reasonable hope of explaining obscure points or of finding clues that will lead to the explanation, whereas in other regions there are many problems that can receive no aid from living tribes.

Nowhere on this continent is there found a greater wealth of symbolism than in the region of the Hopi mesas, among the living as well as among the dead. The expression of this symbolism is also of an

^aThirteenth Annual Report of the Bureau of American Ethnology, 1891-92, p. 342.

interesting stage, that of transition from the realistic to the idealistic, and various degrees of growth exhibiting examples of the origin of symbols and their submergence into conventional and geometric forms. The beginning, range, and decay of symbols, as well as the subjects involved, form a fascinating chapter in the history of this region, a history that gives, beyond all in importance, a clew to the thoughts of the pueblo dwellers.

It is hoped in a future paper to present an account of the symbols occurring on objects collected in different localities by the Museum-Gates expedition of 1901, in order to illustrate some of the points mentioned above. The whole subject is too large for the efforts of one person, and perhaps rendering the material accessible to students may be the most valuable result accomplished in this instance. A few of the best specimens showing symbolism are figured on Plates 98 to 101.

DOMESTIC AND FOOD ANIMALS.

A careful search for the bones of animals was maintained in the excavations made in and around the sites examined during the season of 1901.^a This inquiry was pursued in order to ascertain what animals were used for food and what animals were domesticated by the ancient inhabitants of this region.

As to the first item, the remains show that most of the animals of the region were consumed as food; but, as might be anticipated, bones of the carnivora are much rarer than those of the herbivora, the latter represented by deer and rabbit species, and the former by the fox, coyote, wolf, dog, raccoon, badger, wildcat, and puma, but no bones of the bear were observed. Remains of the beaver and small rodents, and bones of birds, especially the turkey, eagle, hawk, and owl, were noted.

Remains of the dog and turkey were found in nearly every ruin, showing the extent of the domestication of these animals in this region. So far as can be determined, the dog and turkey were the only animals domesticated by the pueblo tribes. It was hoped that light might have been thrown upon the question of domestication of other animals, namely, the deer,^b and an auchenia (llama), as affirmed by Cushing from figurines found on the Rio Salado, in southern Arizona.^c The writer

^a Work of this character was begun in 1896, on the Homolobi ruins, and continued in 1897 in connection with environmental studies in the Southwest. See Hough, *Environmental Interrelations in Arizona*; *American Anthropologist*, XI, May, 1898, p. 133; and J. W. Fewkes, *Twentieth Annual Report of the Bureau of American Ethnology*.

^b Nadaillac, *Prehistoric America*, London, 1885, pp. 205, 219, affirms the domestication of the deer in Colorado and Arizona.

^c See Dr. Washington Matthews, U. S. A. in *Land of Sunshine* (now *Out West*), XII, March, 1900.

has copied numerous pictographs in the valley of the Little Colorado River showing unmistakably the herding of turkeys and of deer by men. It is possible that the scene depicted in the bowl found at Linden (Plate 19) is of this character. In this connection the congeries of small cells adjoining the ruins at Pinedale, in the White Mountains of Arizona, is interesting. Still, the evidence presented so far as to the domestication of other animals than the dog and turkey is unsatisfactory.

It is hoped that in future excavations in the Southwest all bones of animals may be carefully collected for the sake of the aid they afford to a fuller understanding of the life of the pueblo dwellers.

PRESERVATION OF ANCIENT RUINS.

One of the most depressing features connected with the work in the Pueblo region is the evidence of vandalism and unskilled exploration encountered on almost all of the prehistoric sites. The extent of this devastation can scarcely be realized. No ruin is so obscure or inaccessible that some sheep herder or prospector has not put in some of his tedious hours digging in it.

The settlers of the States and Territories in the Pueblo region from the first were alive to the wonders of the new country and were attracted by the evidences of the former inhabitants. Thus at that time, out of curiosity, many of the ruins were visited; axes, etc., were picked up from the surface, and perhaps a little cursory excavation done, the specimens secured forming household ornaments.

Later, the various governmental explorations called widespread attention to the ruined pueblos of the Southwest, and soon it was found that relics from these pueblos had commercial value. With this enterprising wedge, the collecting of "relics" became a business, and men traversed the region for the sole purpose of tearing up the ruins for their private gains. Almost every trader either employed Indians to dig or bought all the specimens that Indians brought in at a nominal price, and many were the men who had "collections" for sale. A few of these individuals, profiting by the scientific methods of governmental and institutional explorations, were careful to catalogue and localize the specimens as far as possible at second hand, finding that such data increased the value. To give an idea of the extent of this vandalism and unscientific collection, it may be said that from one town alone during the past ten years about 20,000 specimens have been shipped; from other neighboring towns, about 7,000 specimens. From the same points during this period about 10,000 specimens have been shipped by scientific exploring parties. The speculative collecting was from Indian reservations, railroad and Government lands.

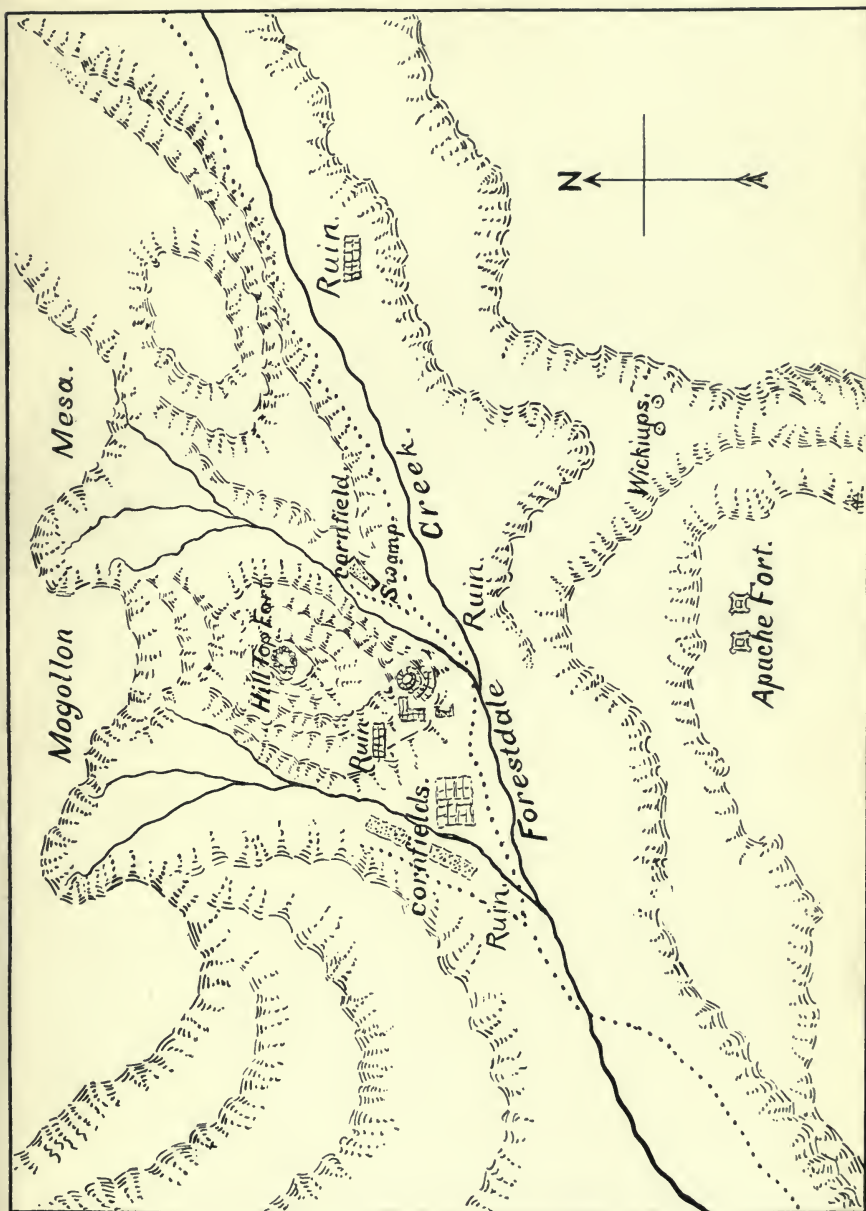
These facts have been known for some time, and a bill for the preservation of ancient ruins has been before Congress several terms, but the bill has not been enacted into law. Indirectly, however, Congress has worked for the preservation of the ruins by reservations of public domain, and in a notable instance has preserved the famous ruin called Casa Grande.

In this connection the Interior Department has done yeoman service in hindering, if not preventing, further despoiling of the ruins on governmental lands by instructions to its agents and by sending inspectors into the field for the purpose of warning offenders.

That there was a sentiment among some of the people of the Southwest in favor of the preservation of the ruins is shown by sundry actions taken by legislative bodies and the formation of societies with such end in view. The legislature of Arizona took action some years ago without apparent success. The Arizona Antiquarian Society founded through the efforts of the late Dr. Joshua Miller, of Prescott, endeavors to preserve and to prevent the despoiling of sites of antiquarian interest in the Territory. In New Mexico also the subject is receiving considerable attention.

SUMMARY OF WORK.

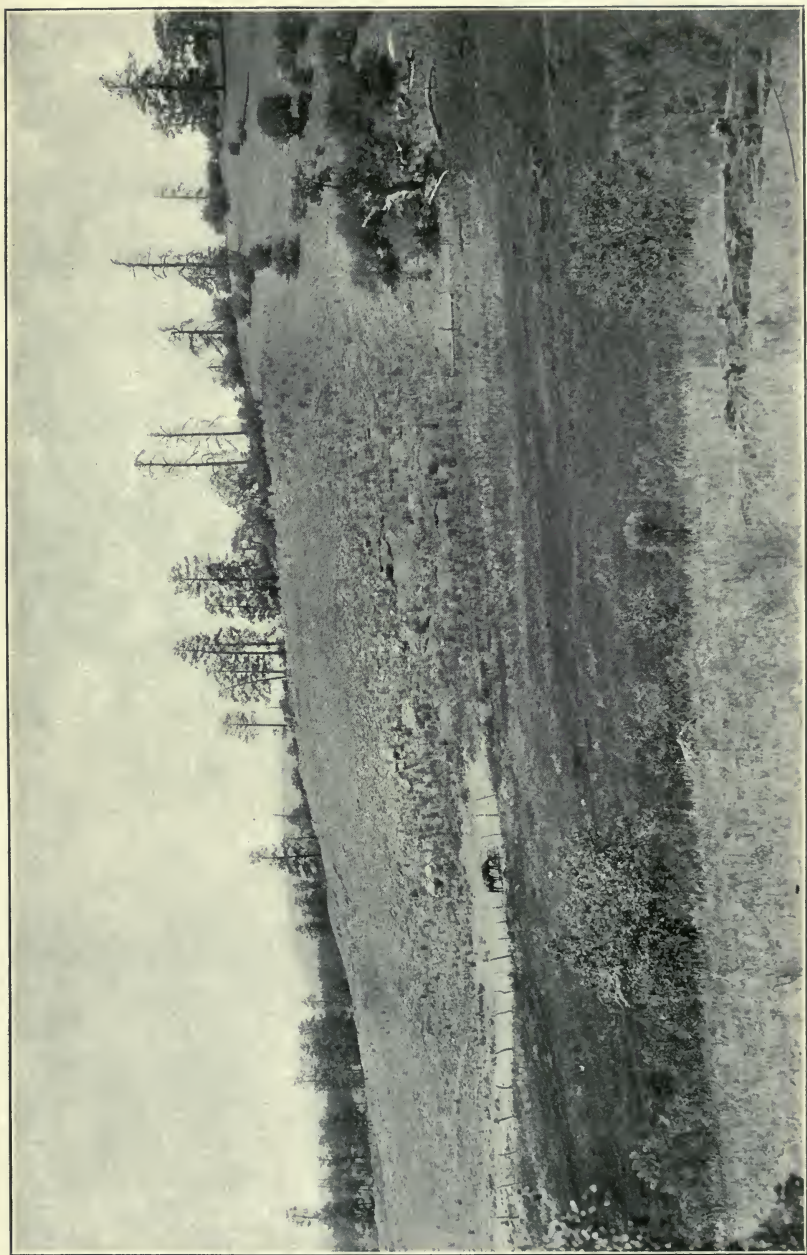
During the season over 55 ruins were visited, and 18 of these were excavated in a region nearly 200 miles north and south by 70 miles east and west. Some idea of the difficulties encountered, aside from 800 miles of wagon travel, may be gathered when it is known that five of the groups required dry camps, water being hauled considerable distances. The work, however, was quite successful, 2,500 specimens having been collected. In connection with this work, ethnological photographs, data, and specimens were secured from the Apache, Navaho, and Hopi Indians.



SKETCH MAP OF FORESTDALE RUINS.



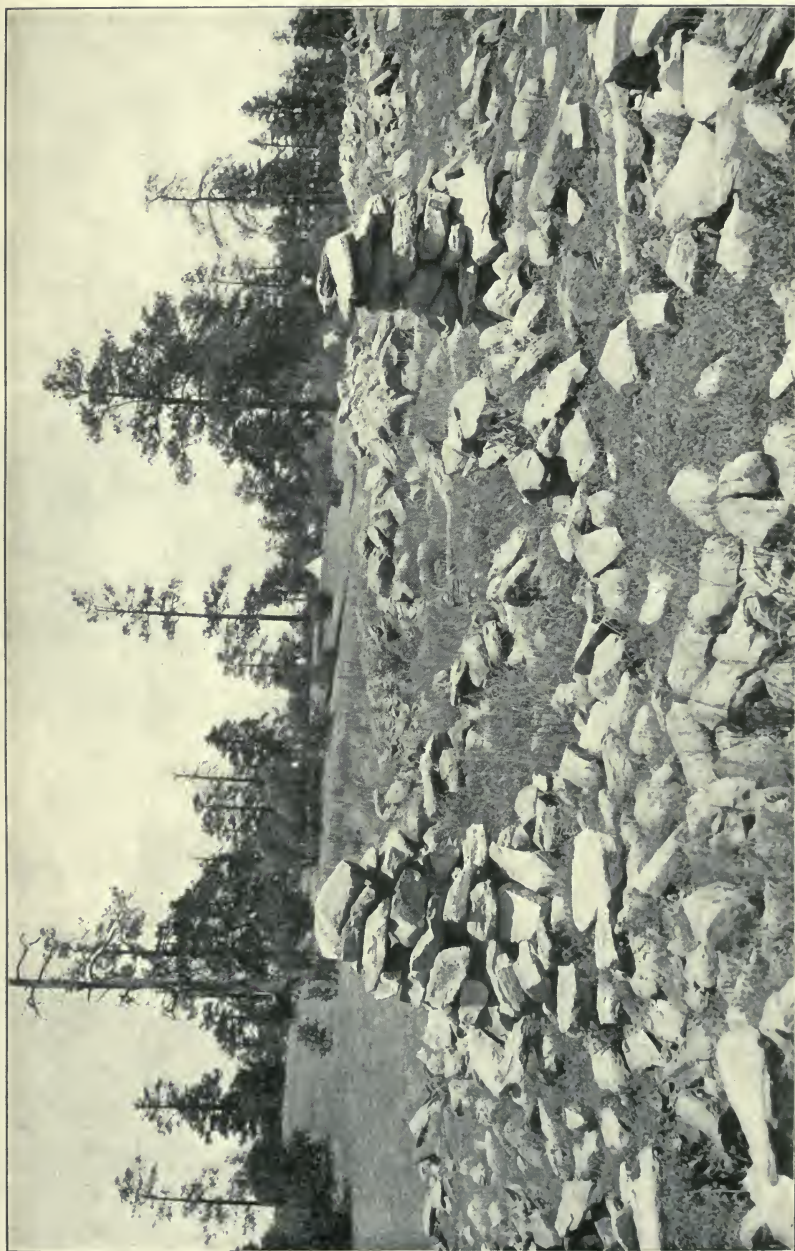
PLAN OF TUNDASTUSA RUIN.
Forestdale, Arizona.



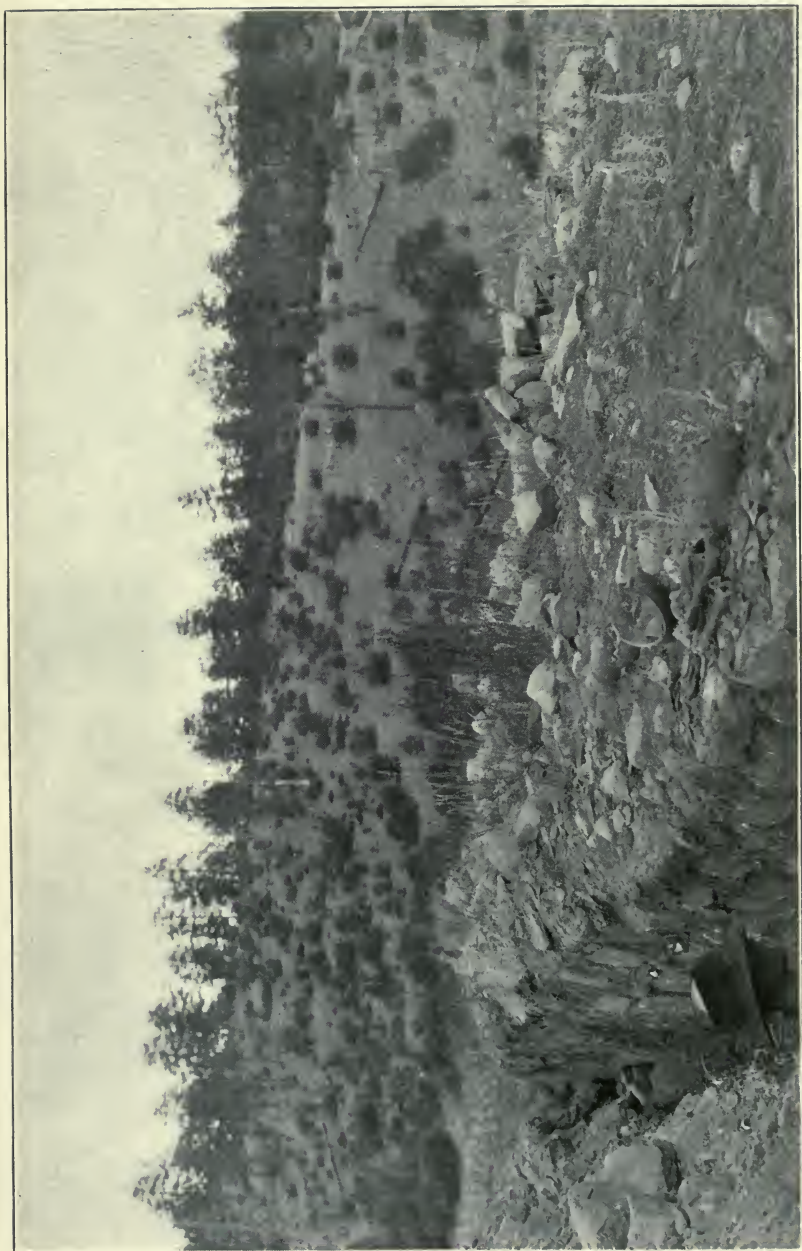
GENERAL VIEW OF TUNDASTUSA RUIN.
Forestdale, Arizona.



VIEW OF KIVA.
Forestdale, Arizona.



VIEW ON ACROPOLIS,
Forestdale, Arizona.

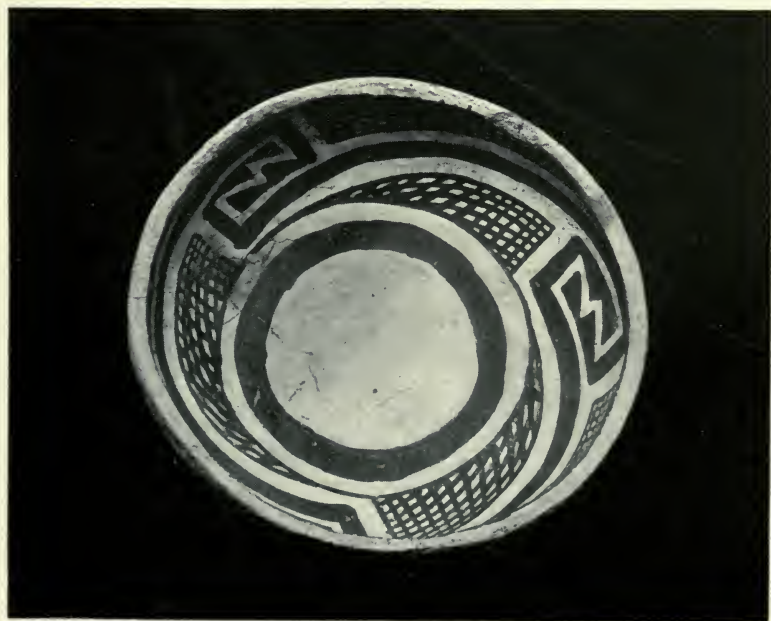


VIEW OF WALL OF ACROPOLIS,
Foresidale, Arizona.



Length, $5\frac{1}{2}$ in.; width, $4\frac{1}{2}$ in.; height, 3 in.

Cat. No. 212830.



Diam., $5\frac{1}{2}$ in.; height, $2\frac{1}{2}$ in.

Cat. No. 212831.

BIRD-FORM MORTUARY VASE AND BOWL.

Forestdale, Arizona.



LENGTH, $2\frac{5}{8}$ IN. WIDTH, $1\frac{7}{8}$ IN. HEIGHT, $1\frac{1}{4}$ IN. CAT. No. 212841



LENGTH, $9\frac{3}{4}$ IN. HEIGHT, $2\frac{1}{2}$ IN. CAT. No. 212837



DIAM. $5\frac{1}{2}$ IN. HEIGHT, $2\frac{1}{2}$ IN. CAT. No. 212834



DIAM. $5\frac{5}{8}$ IN. HEIGHT, 5 IN. CAT. No. 213094



Diam., 6½ in.; height, 5½ in. Cat. No. 212837.



Diam., 10½ in.; height, 7½ in. Cat. No. 212828.

MORTUARY VASES OF GRAY WARE.
Forestdale, Arizona.



FETICHES OF POTTERY AND STONE, AND SCRAPERS.
Forestdale, Arizona.



BONE IMPLEMENTS.
Forestdale, Arizona.

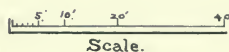
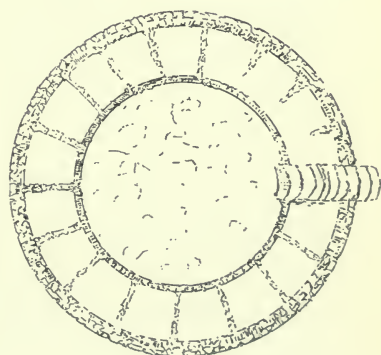
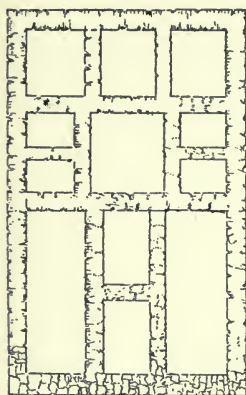


STONE AND BONE IMPLEMENTS.
Interior Sawmill, Arizona.

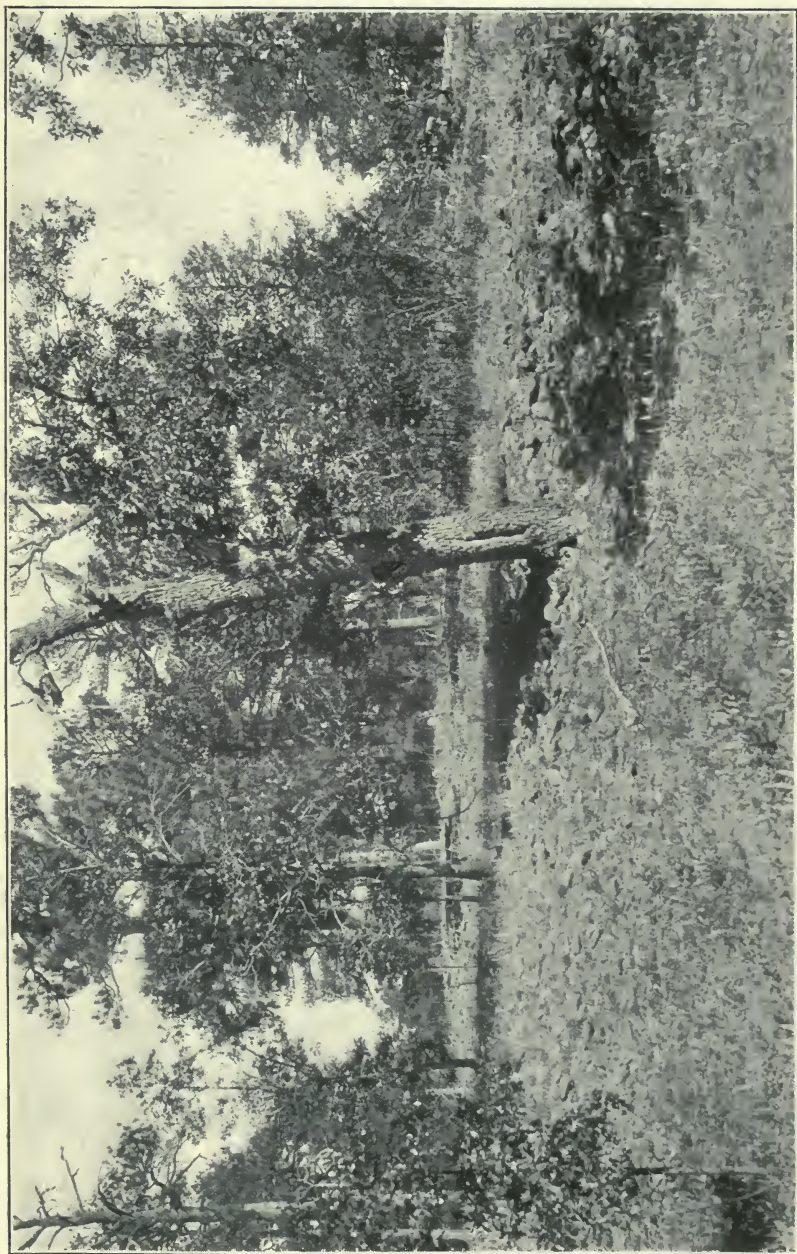


PLAN OF POTTERY HILL RUIN.

Linden, Arizona.



PLAN OF SMALLER RUIN NEAR LINDEN.
Arizona.



CIRCULAR PORTION OF SMALL RUIN NEAR LINDEN.

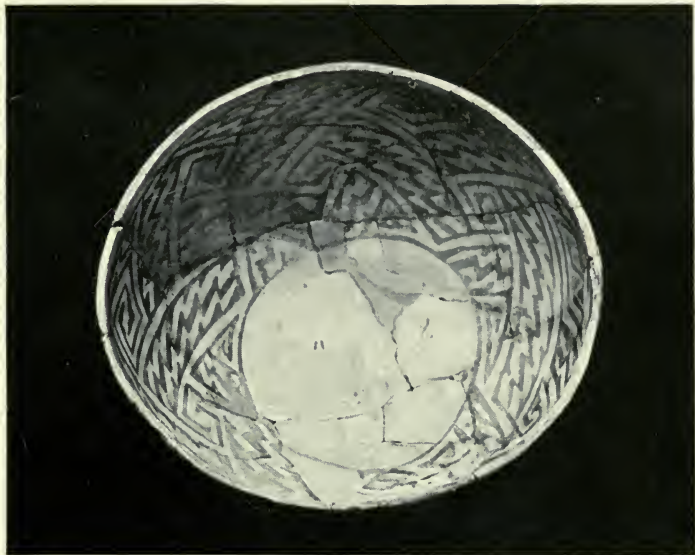


Diam., $5\frac{1}{2}$ in.; height, $5\frac{1}{4}$ in. Cat. No. 212978.
Diam., $6\frac{1}{2}$ in.; height, 6 in. Cat. No. 212977.

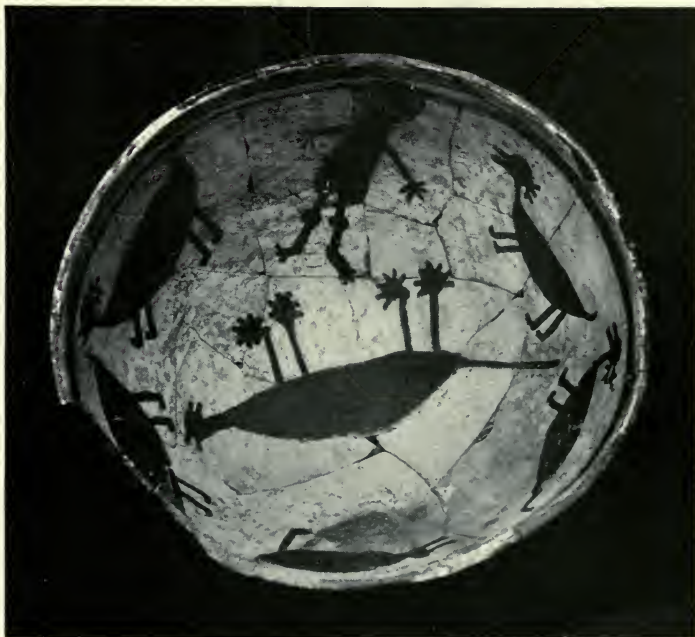


Diam., $1\frac{7}{8}$ in.; height, $2\frac{1}{4}$ in. Cat. No. 212979.
Diam., $5\frac{1}{4}$ in.; height, $4\frac{3}{4}$ in. Cat. No. 212891.
Diam., $5\frac{1}{4}$ in.; height, $2\frac{3}{4}$ in. Cat. No. 212898.

GRAY WARE.
Linden, Arizona.



Diam., $9\frac{1}{8}$ in.; height, $5\frac{1}{8}$ in. Cat. No. 212988.



Diam., $8\frac{3}{8}$ in.; height, $4\frac{1}{8}$ in. Cat. No. 212929.

BOWLS OF GRAY WARE.

Linden, Arizona.

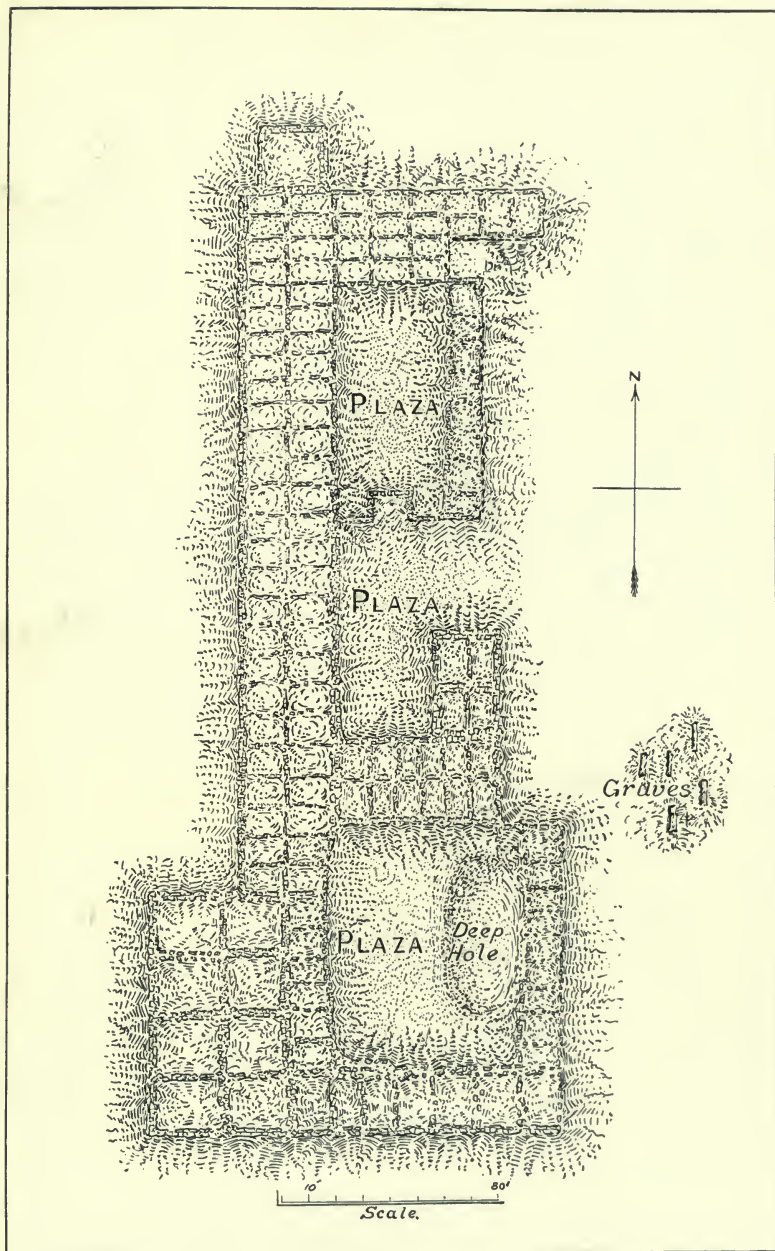


Diam $4\frac{7}{8}$ ins. Height 3 ins. Cat No. 212,895

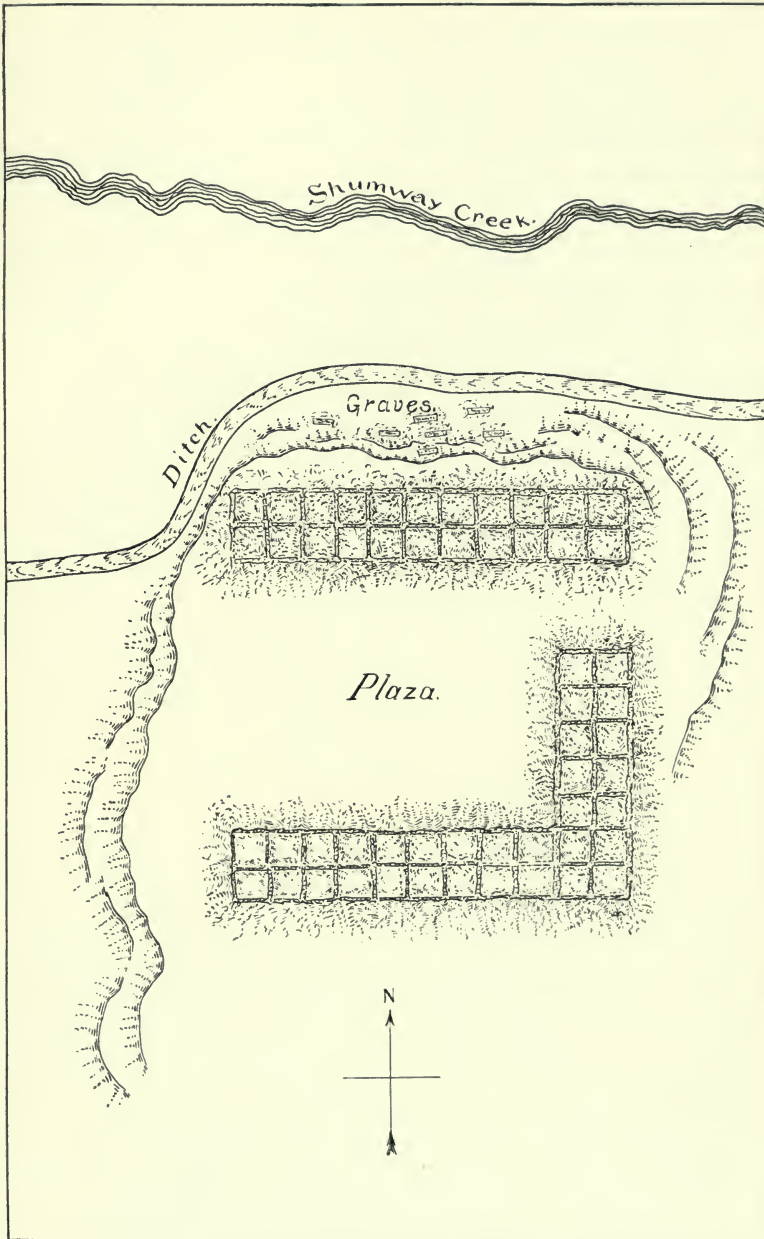


Diam. 8 ins. Height 4 ins Cat. No. 212,900

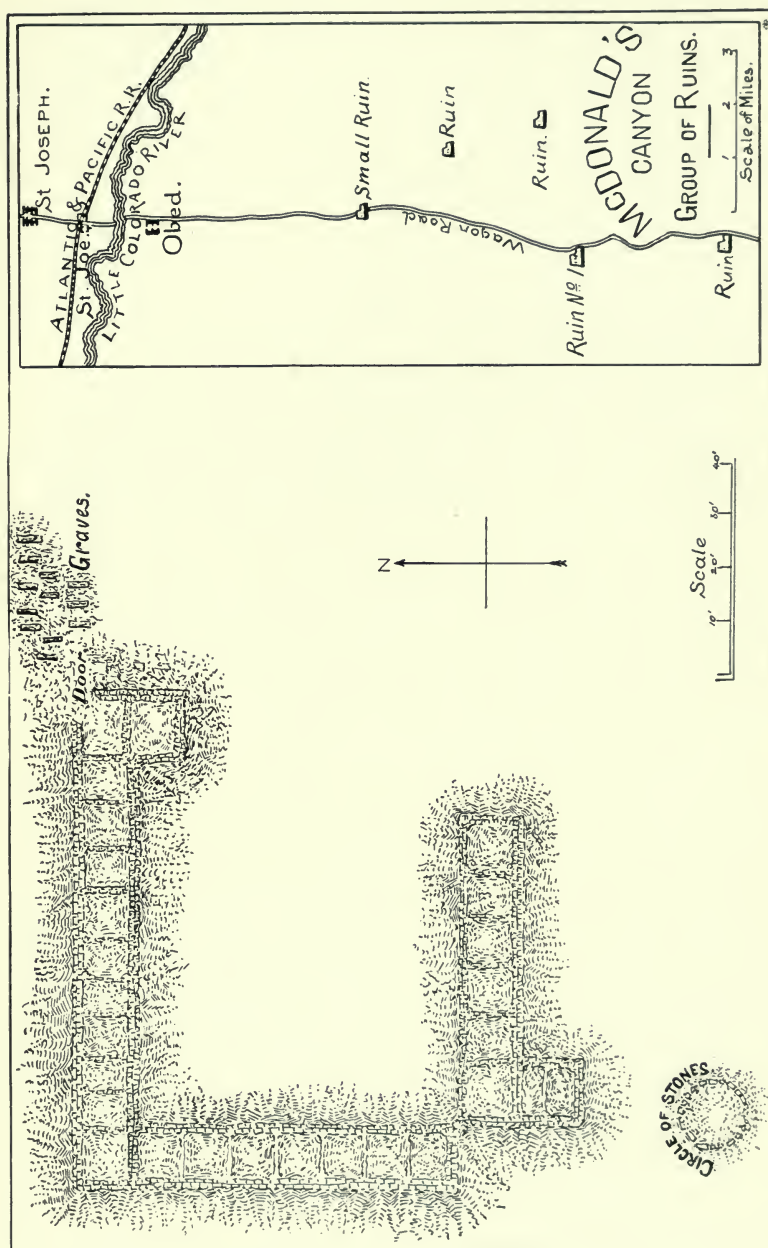
BOWLS OF RED WARE WITH EXTERIOR DECORATION.
LINDEN, ARIZONA.



PLAN OF HUNING RUIN.
Showlow, Arizona.



PLAN OF SHUMWAY RUIN.
Arizona.



PLAN OF RUIN.

McDonald's Canyon, Arizona.



Diam., 13 in.; height, 5 $\frac{1}{4}$ in. Cat. No. 211963.



Diam., 13 in.; height, 6 $\frac{1}{8}$ in. Cat. No. 212260.

BOWLS OF GRAY WARE.
McDonald's Canyon, Arizona.



Diam., $10\frac{1}{2}$ in. height, $5\frac{1}{2}$ in. Cat. No. 212265.



Diam., $11\frac{1}{2}$ in.; height, 6 in. Cat. No. 212261.

BOWLS OF GRAY WARE.
McDonald's Canyon, Arizona.



Length, 6 in.; height, 5½ in. Cat. No. 212297.



Diam., 6 in.; height, 5½ in. Cat. No. 212282.

VASES OF GRAY WARE.
McDonald's Canyon, Arizona.



RUGOSE BOWL, RED WARE, SIDE AND BACK.

MCDONALDS CANYON, ARIZONA.

Diam. $6\frac{1}{2}$ ins. Height $3\frac{3}{4}$ ins. Cat. No. 212,301



RUGOSE BOWL, SIDE AND BACK.

MCDONALDS CANYON, ARIZONA.

Diam. $8\frac{5}{8}$ ins Height 4 ins. Cat. No. 212,299



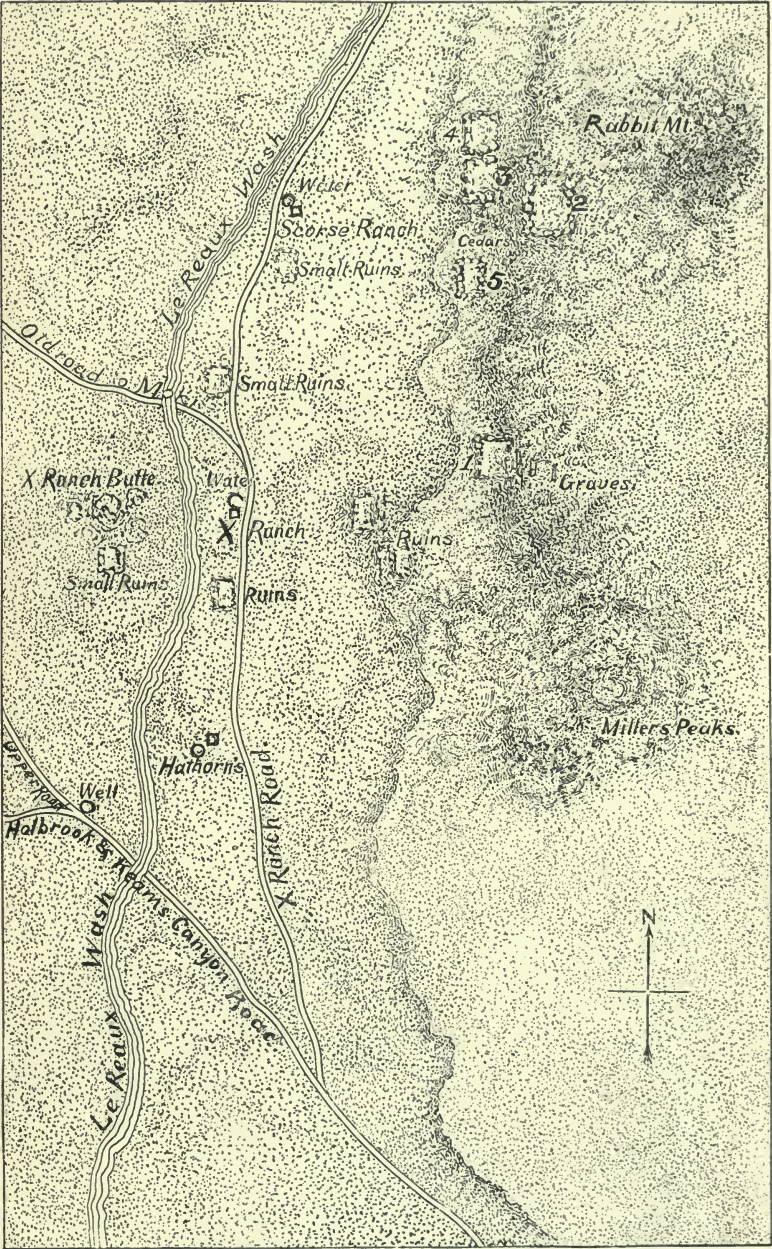
DIAM. $5\frac{1}{8}$ IN. HEIGHT, $4\frac{5}{8}$ IN. CAT. No. 212280



DIAM. $3\frac{3}{8}$ IN. HEIGHT, $3\frac{1}{2}$ IN. CAT. 212279

CANTEEN AND HANDLED VASE.

Mc Donalds Canyon, Arizona.



SKETCH MAP OF SCORSE RANCH RUINS.
Le Roux Wash, Arizona.



Cat. Nos. 212522 and 212529.



Cat. Nos. 212536 and 212523.

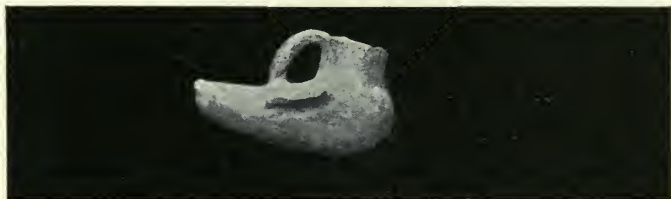


Cat. Nos. 212535 and 212538.

HANDLED VASES, GRAY WARE.
Scorse Ranch, Arizona.



Cat. No. 212503.



Cat. No. 212499.

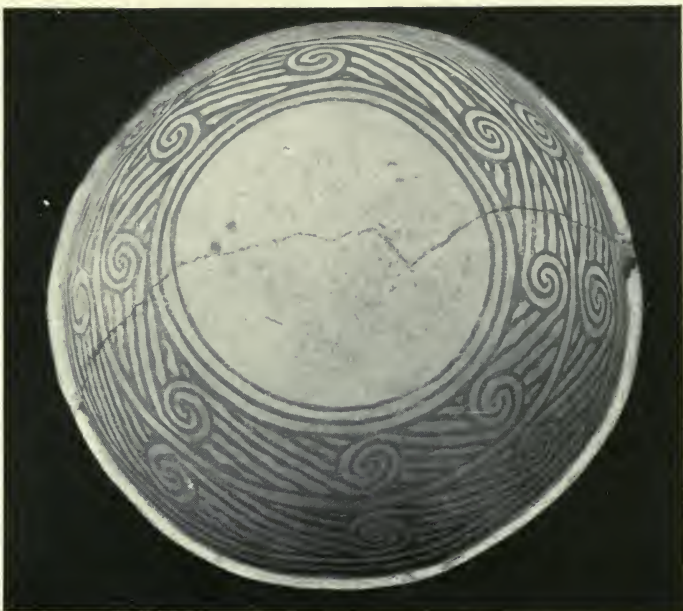


Cat. Nos. 212520 and 212531.



Cat. Nos. 212423 and 212594

BIRD AND OTHER FORMS OF GRAY WARE.
Scorse Ranch, Arizona.



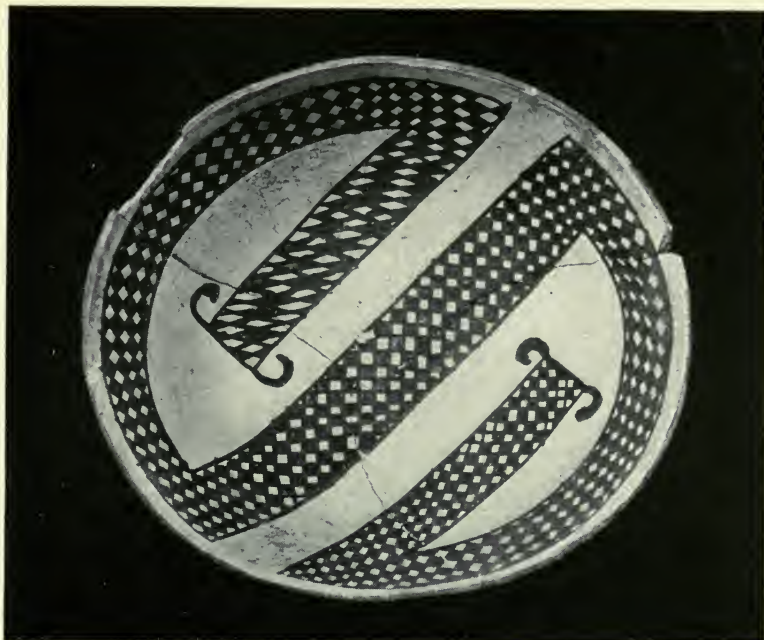
Diam., $9\frac{1}{8}$ in.; height, $5\frac{1}{4}$ in. Cat. No. 212436.



Diam., 9 in.; height, $4\frac{1}{2}$ in. Cat. No. 212441.

BOWLS OF GRAY WARE.

Scorse Ranch, Arizona.



Diam., $9\frac{1}{2}$ in.; height, $3\frac{1}{8}$ in. Cat. No. 212430.



Diam., $9\frac{1}{2}$ in.; height, 5 in. Cat. No. 212429.

BOWLS OF GRAY WARE.
Scorse Ranch, Arizona.



Cat. No. 212,550



Cat. No. 212,553



Cat. No. 212,554

BOWLS OF RED WARE.
SCORSE RANCH, ARIZONA.



CAT. No. 212488



CAT. No. 212582



CAT. No. 212494



CAT. No. 212508

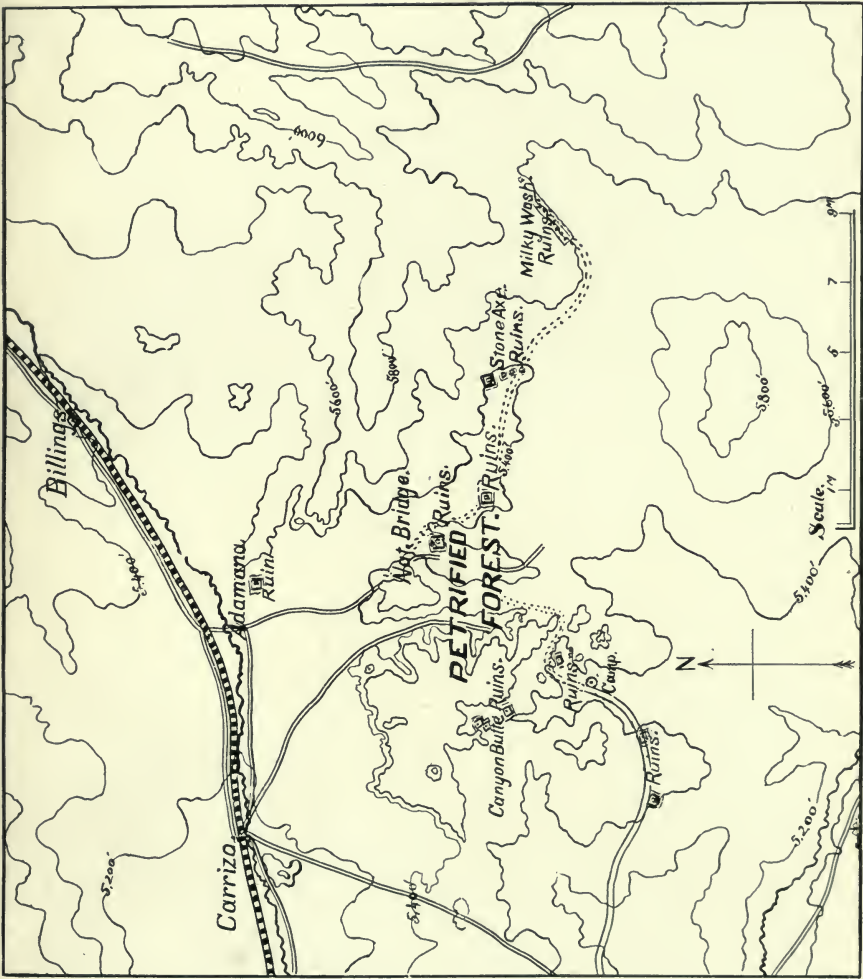


CAT. No. 212509

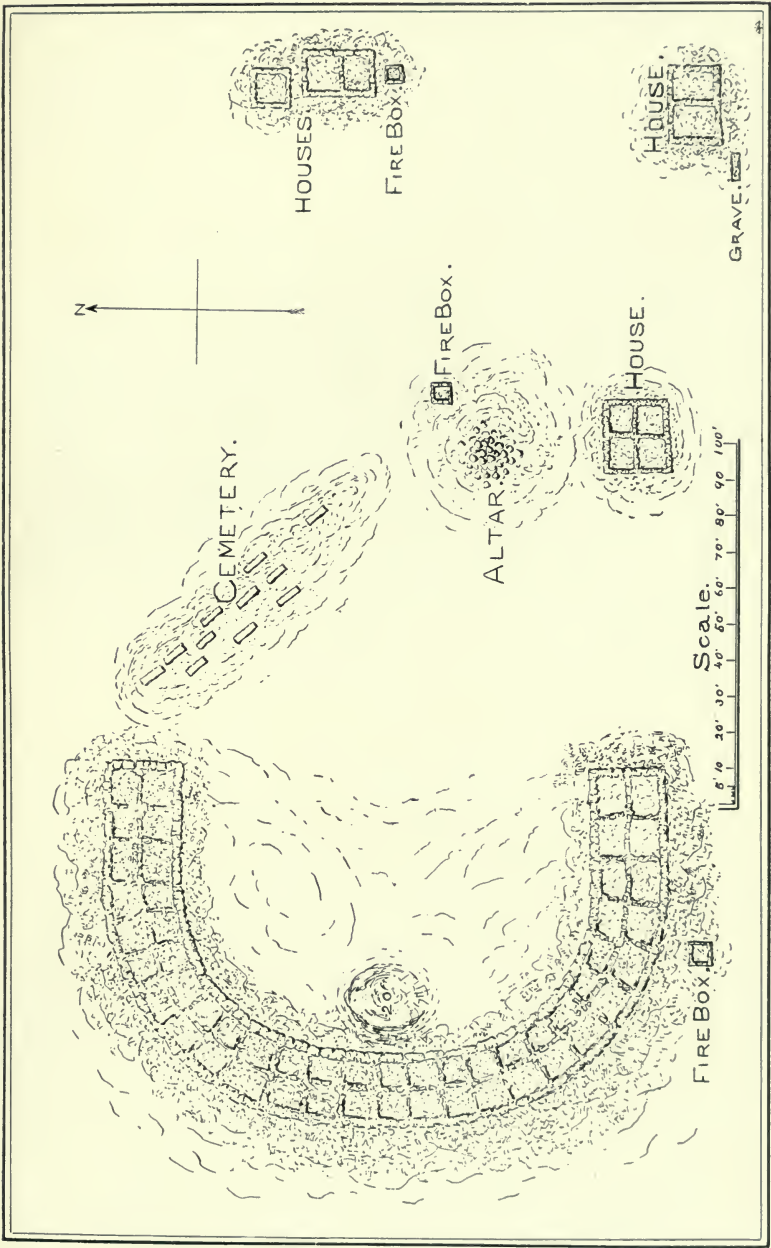


STONE AXES, MORTAR AND PESTLE.

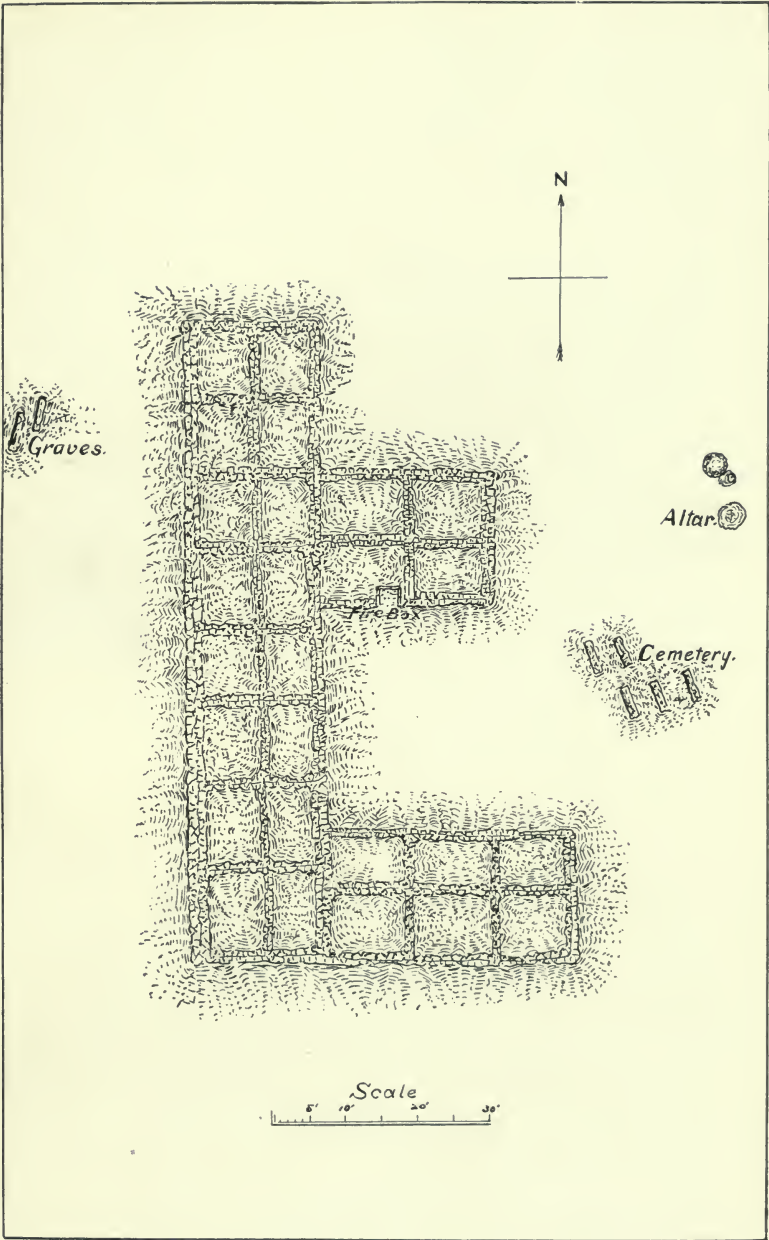
Scorse Ranch, Arizona.



SKETCH MAP OF REGION OF THE PETRIFIED FOREST, ARIZONA.



PLAN OF RUIN 1.
Canyon Butte Wash, Arizona.



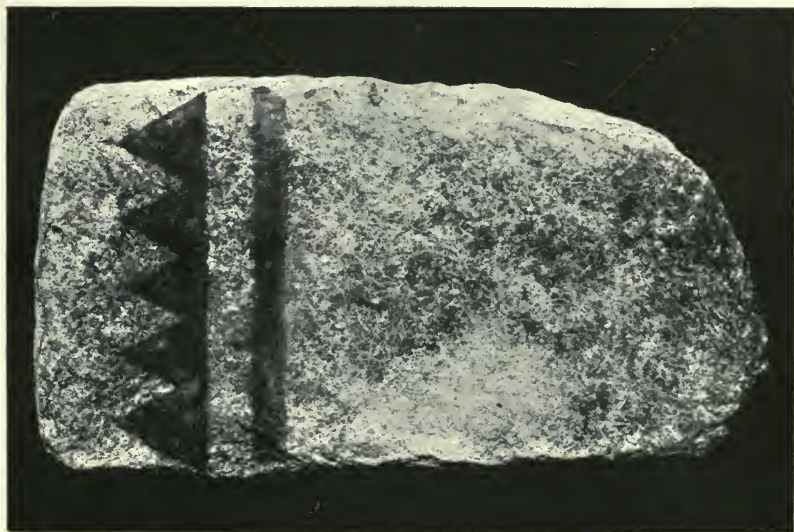
PLAN OF RUIN 2.
Canyon Butte Wash, Arizona.



PLAN OF RUIN 3.
Canyon Butte Wash, Arizona.



Diam., 8½ in.; height, 3½ in. Cat. No. 212108.



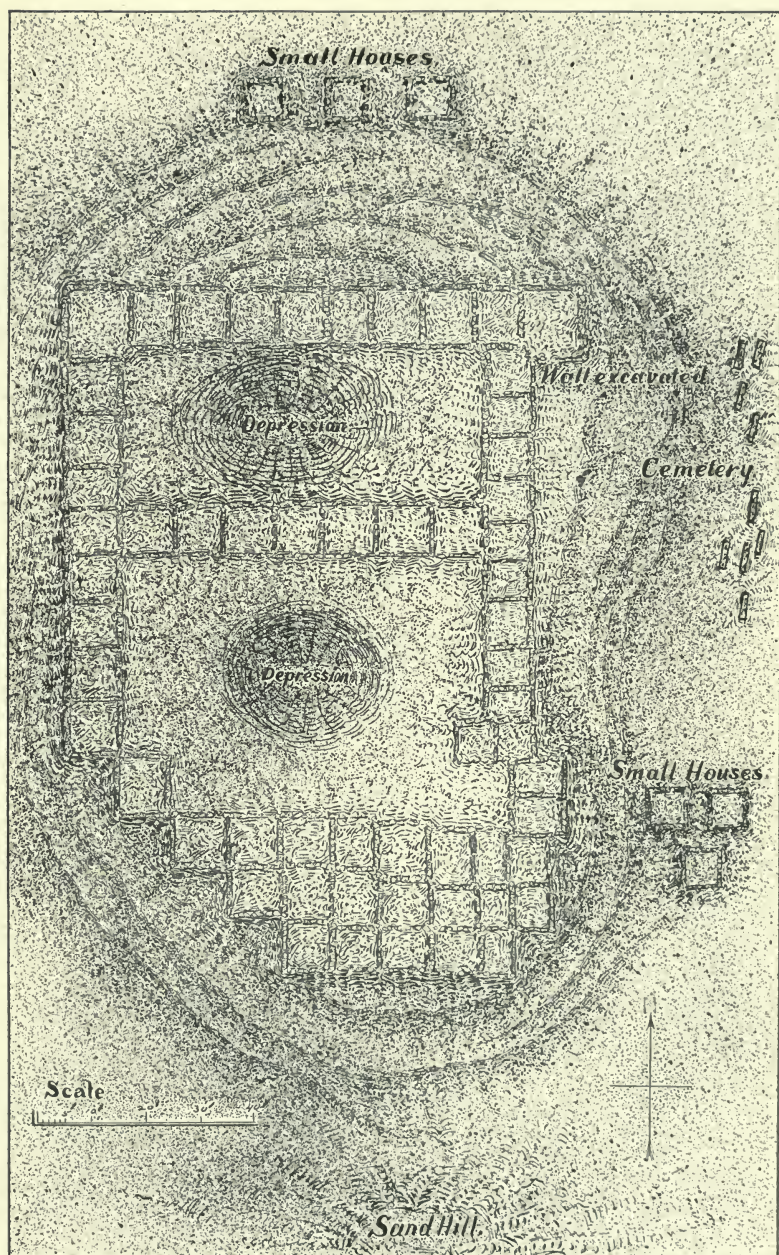
Length, 12 in.; width, 7 in.; height, 2 in. Cat. No. 212066.

POLYCHROME BOWL AND PAINTED STONE TABLET.

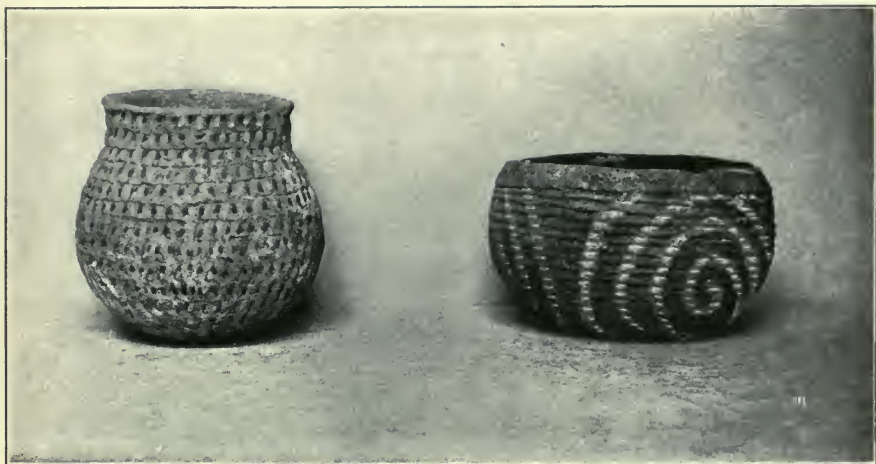
Canyon Butte Wash, Arizona.



OUTFIT OF MEDICINE MAN.
Canyon Butte Wash, Arizona.



PLAN OF RUIN 4.
Canyon Butte Wash, Arizona.



Diam., $3\frac{1}{4}$ in.; height, $3\frac{1}{4}$ in. Cat. No. 212042.
Diam., 4 in.; height, $2\frac{1}{4}$ in. Cat. No. 212237.



Diam., 5 in.; height, $4\frac{1}{2}$ in. Cat. No. 212080.
Diam., $4\frac{5}{8}$ in.; height, $3\frac{1}{4}$ in. Cat. No. 212163.

COILED WARE.

Canyon Butte Wash, Arizona.



Diam. $5\frac{3}{8}$ ins. Cat. No. 212,170



Diam. 9 ins. Cat. No. 212,116



Diam. $8\frac{1}{4}$ ins. Cat. No. 212,055





Diam. $11\frac{3}{4}$ ins. Cat. No. 212,236



Diam. $12\frac{3}{4}$ ins Cat. No. 212,180

RED BOWLS WITH WHITE EXTERIOR DECORATION.

CANYON BUTTE WASH, ARIZONA.



DIAM. $11\frac{1}{2}$ IN. HEIGHT, 5 IN. CAT. No. 212074



SIDE AND INTERIOR VIEW OF SAME.

RED AND BROWN BOWL, EXTERIOR AND INTERIOR DECORATION.
Canyon Butte, Arizona



RED AND BROWN BOWL, EXTERIOR DECORATION.

CANYON BUTTE WASH, ARIZONA.

Diam. $11\frac{1}{2}$ ins. Height 5 ins Cat. No. 212,074



Diam., $8\frac{1}{8}$ in.; height, 4 in. Cat. No. 212056.



Diam., $11\frac{1}{4}$ in.; height, $6\frac{1}{8}$ in. Cat. No. 212075.

BOWLS OF GRAY WARE.
Canyon Butte Wash, Arizona.



Diam., 6 in.; height, 5 in. Cat. No. 212026.



Diam., 7½ in.; height, 7½ in. Cat. No. 155128.



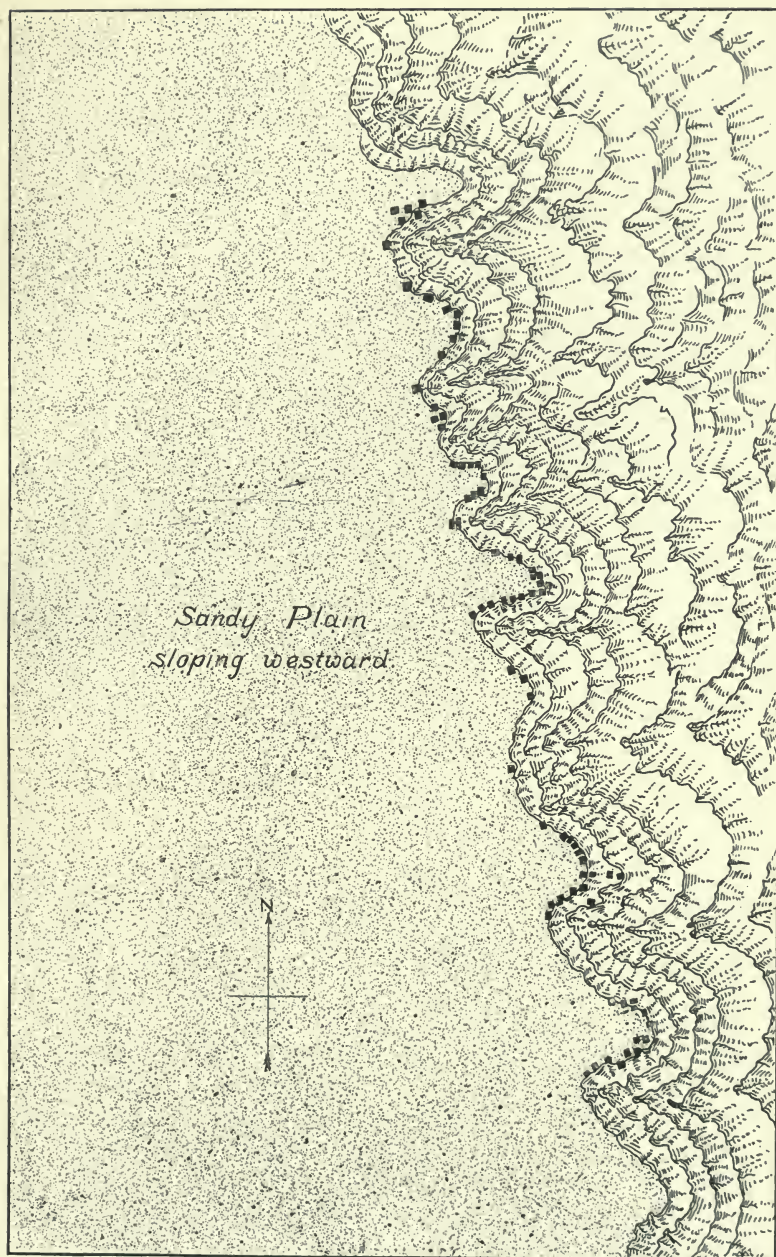
Diam., 7 in.; height, 8¼ in. Cat. No. 68376.

VASES OF GRAY WARE.

Northeastern Arizona and New Mexico.



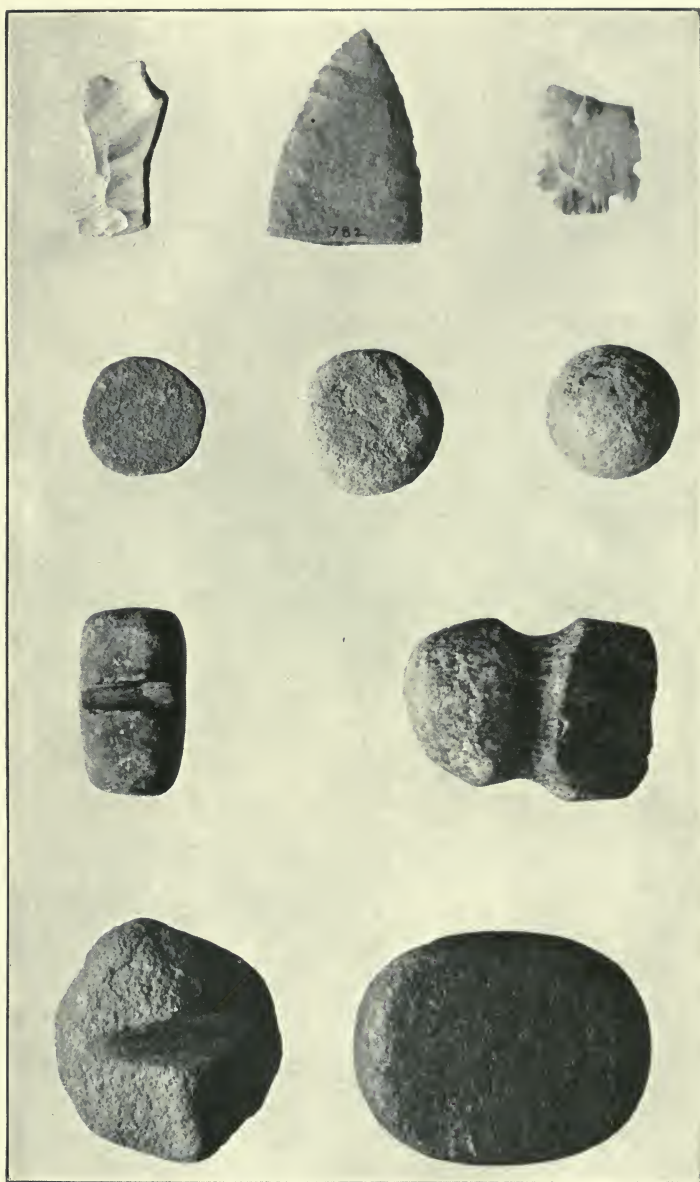
PIPES FROM ANCIENT PUEBLOS.
Arizona.



PLAN OF MILKY HOLLOW RUIN, ARIZONA.



PLAN OF STONE AXE RUIN, ARIZONA.



STONE IMPLEMENTS.

Stone Axe, Arizona.



BONE, POTTERY, SHELL, AND STONE OBJECTS.

Stone Axe Ruin, Arizona.



DIAM. $15\frac{1}{2}$ IN. HEIGHT, $10\frac{1}{2}$ IN. CAT. No. 212753

LARGE VASE, POLYCHROME WARE.
Stone Age, Arizona.



DIAM. $6\frac{1}{4}$ IN. HEIGHT, $2\frac{3}{4}$ IN. CAT. No. 212737



DIAM. $6\frac{1}{4}$ IN. HEIGHT, $4\frac{1}{2}$ IN. CAT. No. 212740

BOWL AND VASE.
Stone Axe, Arizona.



DIAM. 9 IN. HEIGHT, 4 IN. CAT. No. 212735



DIAM. 8½ IN. HEIGHT, 3⅝ IN. CAT. No. 212734

BOWLS, YELLOW WARE.

Stone Axe, Arizona.



DIAM. $8\frac{1}{4}$ IN. HEIGHT, $3\frac{3}{4}$ IN. CAT. No. 212718



DIAM. $8\frac{1}{2}$ IN. HEIGHT, $3\frac{3}{4}$ IN. CAT. No. 212746

BOWLS SHOWING SYMBOLISM.

Stone Axe Ruin, Arizona.



Diam., 8 in.; height, $3\frac{1}{4}$ in. Cat. No. 212742.



Diam., 9 in.; height, $3\frac{1}{4}$ in. Cat. No. 212741.

BOWLS, WHITE AND GILA WARE.
Stone Axe Ruin, Arizona.



DIAM. $8\frac{3}{4}$ IN. HEIGHT, $3\frac{3}{4}$ IN. CAT. No. 212751



DIAM. $9\frac{1}{4}$ IN. HEIGHT, $3\frac{1}{2}$ IN. CAT. No. 212743

BOWLS, YELLOW-BROWN AND RED, WITH WHITE LINES.
Stone Axe Ruin, Arizona.



Diam. $7\frac{1}{2}$ ins. Cat. No. 212,793



Diam. 8 ins. Cat. No. 212,744

BOWLS, RED WARE
STONE AXE RUIN, ARIZONA.

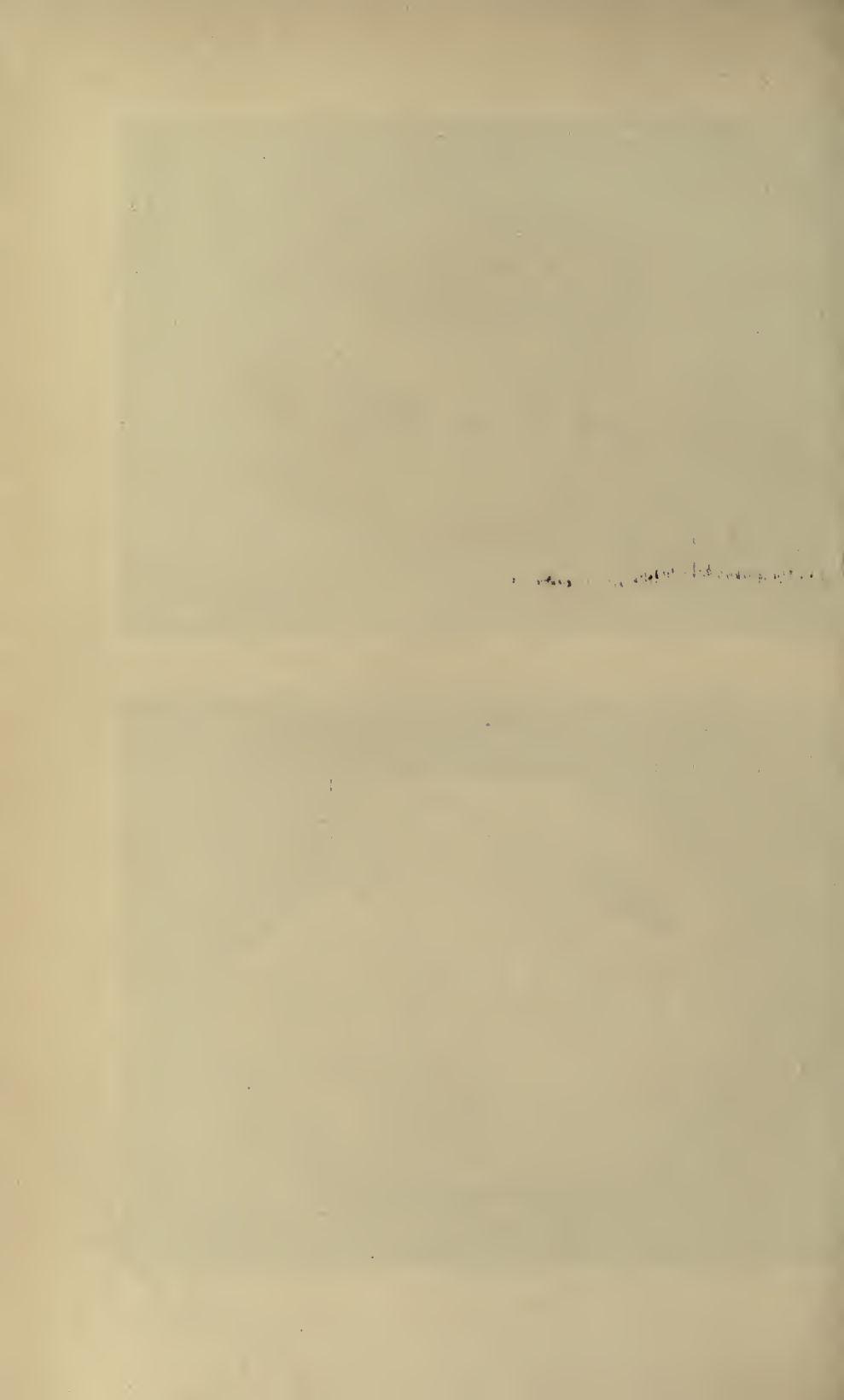


DIAM. $4\frac{1}{8}$ IN. HEIGHT, 3 IN. CAT. No. 212741.



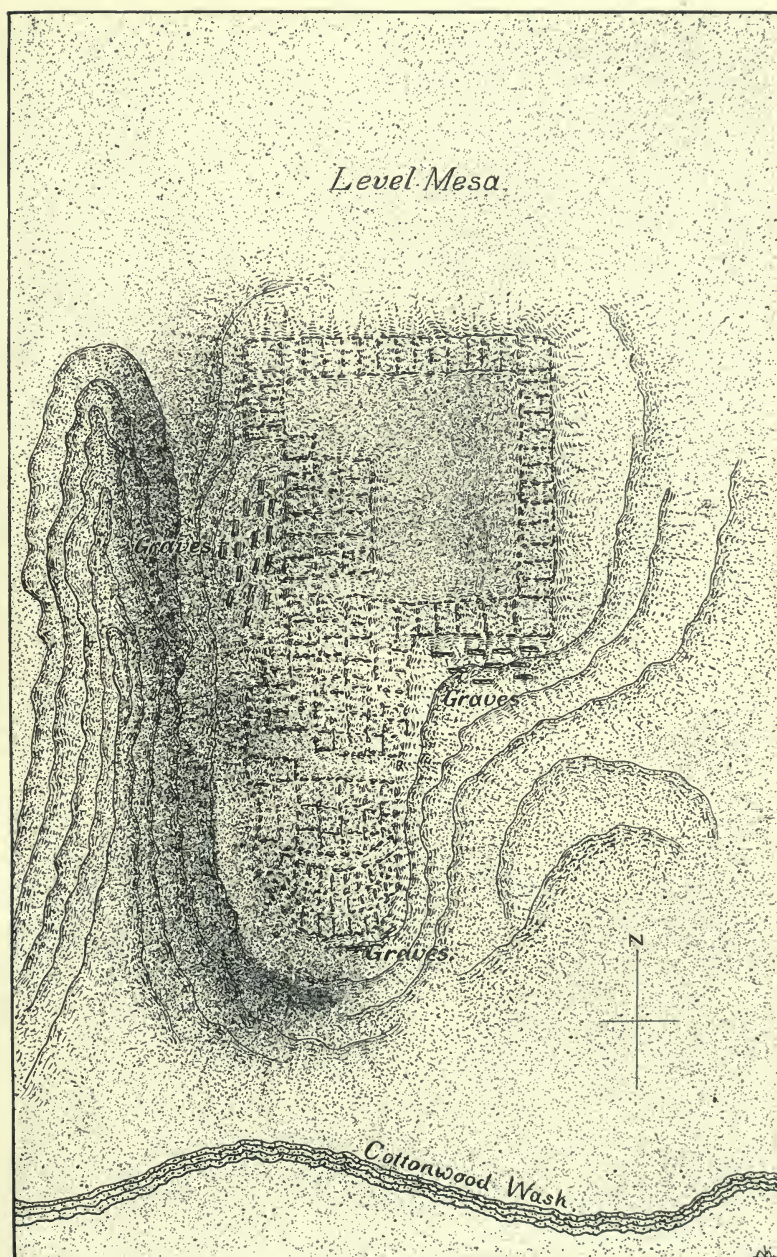
DIAM. $7\frac{1}{8}$ IN. HEIGHT 6 IN. CAT. No. 212790

VASES WITH ANIMAL HANDLES.
Stone Axe Ruin, Arizona.





SKETCH MAP OF BIDDAAHOOCHEE GROUP OF RUINS, ARIZONA.



PLAN OF RUIN ON BLUFF.

Biddahoochee, Arizona.



1, BLACK BUTTE; 2, RUIN IN FRONT OF BUTTE.

Biddahoochee, Arizona.



DIAM. 9 IN. HEIGHT, $1\frac{3}{4}$ IN. CAT. No. 212322



DIAM. $8\frac{1}{2}$ IN. HEIGHT, $3\frac{5}{8}$ IN. CAT. No. 212326

BOWLS, YELLOW WARE.
Biddahoochee, Arizona.



DIAMS. $7\frac{3}{4}$ IN. AND $8\frac{5}{8}$ HEIGHT, $3\frac{1}{4}$ IN. CAT. No. 212321



DIAM. $8\frac{3}{8}$ IN. HEIGHT, 3 IN. CAT. No. 212320

BOWLS, YELLOW WARE.
Biddahoochee, Arizona.



CAT. No. 212381



CAT. No. 212382



CAT. No. 212354



CAT. No. 212333

DIPPERS, CUP, AND HANDLED BOWL.
Biddahoochee, Arizona.



DIAM. $4\frac{5}{8}$ IN. HEIGHT, $3\frac{7}{8}$ IN. CAT. No. 212368



DIAM. $5\frac{1}{4}$ IN. HEIGHT, $4\frac{5}{8}$ IN. CAT. No. 212367

VASES WITH BIRD DECORATION.
Biddahoochee, Arizona.



DIAM. $6\frac{1}{8}$ IN. HEIGHT, $4\frac{7}{8}$ IN. CAT. No. 212363



DIAM. $6\frac{1}{4}$ IN. HEIGHT, $4\frac{1}{4}$ IN. CAT. No. 212366

VASES OF YELLOW-BROWN, AND LEMON-YELLOW.
Biddahoochee, Arizona.



DIAM. $11\frac{1}{2}$ IN. HEIGHT, $8\frac{1}{2}$ IN. CAT. No. 212334

VASE OF ORANGE COLOR.
Biddanoochee, Arizona.



DIAM. $10\frac{1}{4}$ IN. HEIGHT, 4 IN. CAT. No. 212330

BOWL, RED WARE, GREEN DECORATION.
Biddahoochee, Arizona.



DIAM. $7\frac{1}{4}$ IN HEIGHT, $3\frac{3}{8}$ IN. CAT. No. 212345



DIAM. $7\frac{3}{4}$ IN HEIGHT, $3\frac{1}{4}$ IN. CAT. No. 212347

BOWLS OF POLYCHROME WARE.
Biddahoochee, Arizona.



Diam., $8\frac{1}{2}$ in.; height, 4 in. Cat. No. 212329.



Diam., $8\frac{1}{2}$ in.; height, 4 in. Cat. No. 212328.

BOWLS OF WHITE WARE.

Biddahoochee, Arizona.



DIAM. $4\frac{5}{8}$ IN. HEIGHT, $3\frac{7}{8}$ IN. CAT. No. 212369



DIAM. $6\frac{1}{4}$ IN. HEIGHT, 5 IN. CAT. No. 212394

VASES OF WHITE WARE.
Biddahoochee, Arizona.



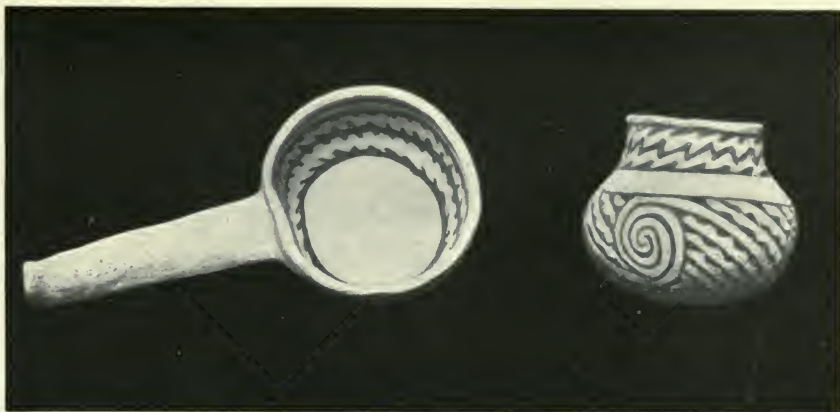
Diam., $6\frac{1}{2}$ in.; height, $2\frac{1}{2}$ in. Cat. No. 212390.



Diam., $6\frac{1}{2}$ in.; height, $6\frac{1}{2}$ in. Cat. No. 212371.

DIPPER AND VASE, GRAY WARE.

Biddahoochee, Arizona.



Cat. Nos. 212392 and 212351.



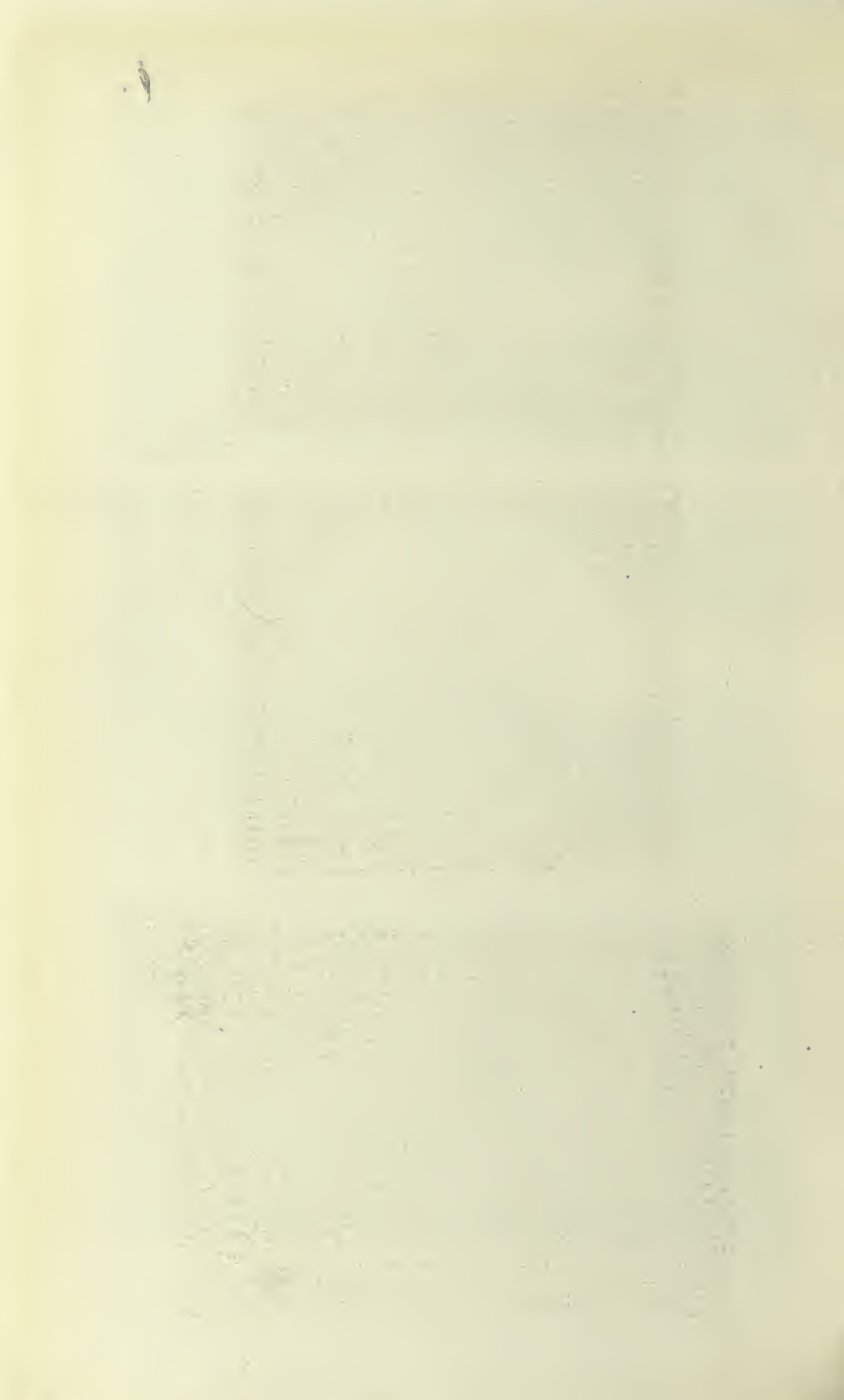
Cat. Nos. 212348 and 212357.



Cat. Nos. 212355 and 212372.

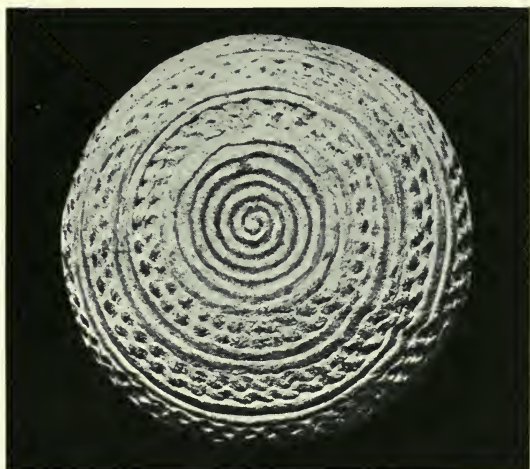
SMALL VESSELS, GRAY WARE.

Biddahoochee, Arizona.





Cat. No. 212375 (front view).



Cat. No. 212375 (bottom).



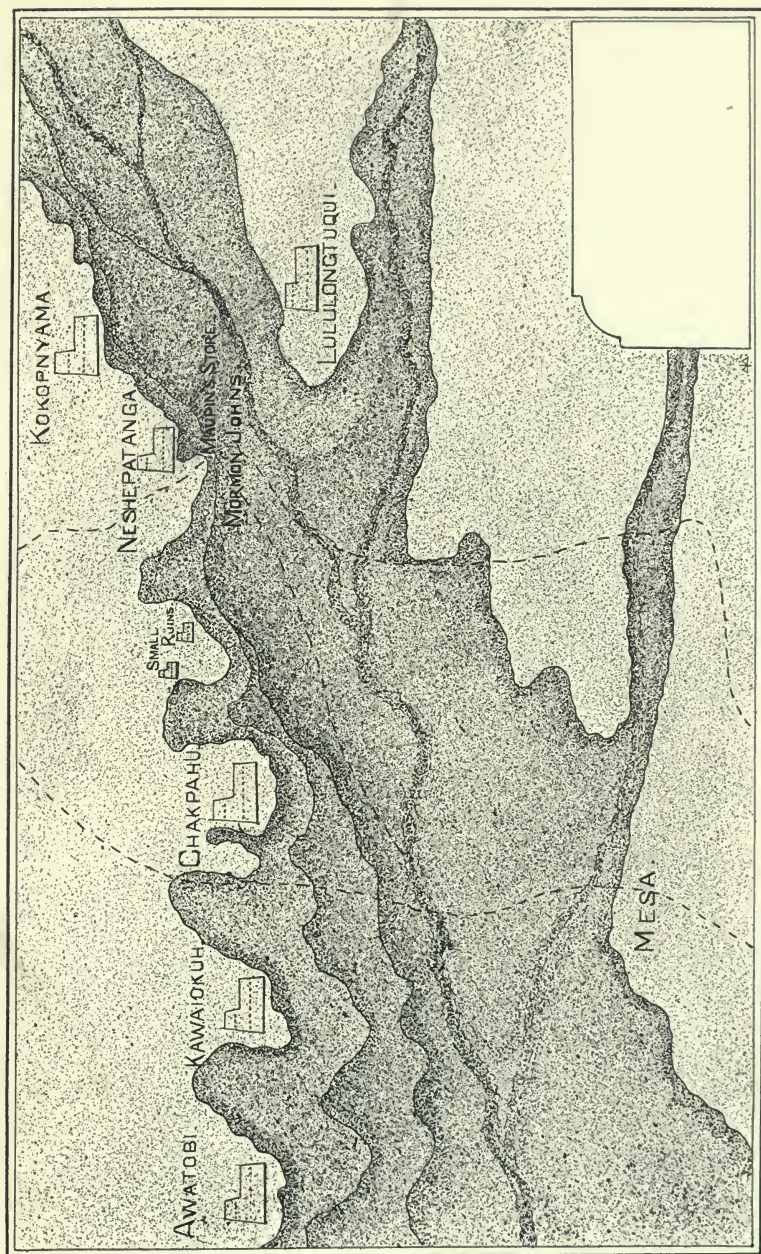
Cat. No. 212373.

COILED WARE.

Biddahoochee, Arizona.



STONE IMPLEMENTS.
Biddahoochee, Arizona.



SKETCH MAP OF JETTYTO VALLEY RUINS, ARIZONA.



GENERAL VIEW OF KOKOPNYAMA RUIN.
Jettyto Valley, Arizona.



CIST IN ROCKS.
Kokopnyama, Jettyto Valley, Arizona.



EXCAVATING IN THE TALUS.
Kokopnyama, Jettyto Valley, Arizona.



HAIR TIED WITH HAIR CORD.
Kokopnyama, Jettyto Valley, Arizona.



COILED BASKETRY.

Kokopnyama, Jettyto Valley, Arizona.



GENERAL VIEW FROM KAWAIOKUH.
Jettito Valley, Arizona.



DECORATIONS ON WALL OF ROOM.
Kawaiokuh, Arizona.



POTTERS' KILN, TWO VIEWS.
Kawalokuh, Jettyto Valley, Arizona.



BURIALS IN HOUSE CEMETERY.
Kawaiokuh, Jetttyo Valley, Arizona.



JAR UNDER FLOOR OF ROOM.
Kawaiokuh, Jettito Valley, Arizona.



LENGTH, $2\frac{5}{8}$ IN. CAT. No. 213171



LENGTH, 6 IN. CAT. No. 213174



LENGTH, 4 IN. CAT. No. 213172



DIAM. 4 IN. CAT. No. 213167

SMALL POTTERY VESSELS.

Kawaiokuh, Arizona.



VASE OF PARROT FORM (GATES COLLECTION),
Kawaiokuh, Arizona.



Diam., $7\frac{1}{4}$ in.; height, $6\frac{1}{4}$ in. Cat. No. 213084.



Diam., 8 $\frac{1}{2}$ in.; height, $6\frac{1}{4}$ in. Cat. No. 213184.

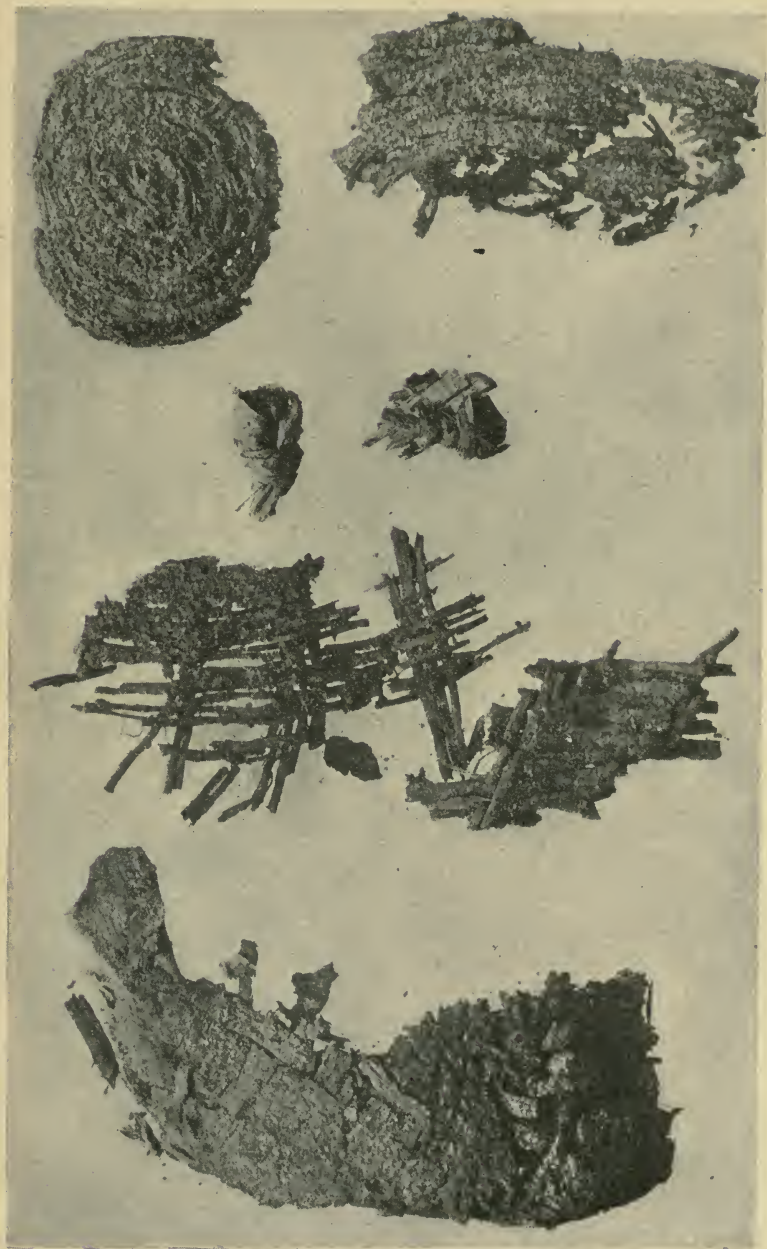
VASES OF GRAY WARE.

Kawaiokuh, Arizona.



SMALL ORNAMENTS AND FIGURINES.

Kawaiokuh, Jettyto Valley, Arizona.



BASKETRY AND MATTING.

Kawaiokuh, Jettyto Valley, Arizona.



Diam. 11 ins. Cat. No. 213,128



Diam. 10 $\frac{3}{4}$ ins. Cat. No. 213,113

POTTERY SHOWING APPLICATION OF COLOR.

KAWAIKUH, ARIZONA.



DIAM. 9 IN. HEIGHT, $3\frac{3}{4}$ IN. CAT. No. 213136



DIAM. $9\frac{1}{4}$ IN. HEIGHT, $3\frac{1}{4}$ IN. CAT. No. 212937

BOWLS SHOWING SYMBOLISM AND COLOR.

Kawaiokuh and Kokopnyama, Arizona.



DIAM. 6 IN. HEIGHT, $2\frac{5}{8}$ IN. CAT. No. 213138



DIAM. 9 IN. HEIGHT, $3\frac{1}{2}$ IN. CAT. No. 213086

POTTERY SHOWING COLOR AND SYMBOLISM.

Kawaiokuh, Arizona.



DIAM. 7 IN. HEIGHT, $3\frac{3}{4}$ IN. CAT. No. 213134



DIAM. $9\frac{1}{4}$ IN. HEIGHT, $3\frac{1}{2}$ IN. CAT. No. 213106

FOOD BOWLS SHOWING BIRD SYMBOLISM.
Kawaiokuh, Arizona.

